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History

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July 22, 1891 - Mar. 17, 1892

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THE JOURNAL

- OF THE -

Cincinnati Society of Natural History.

VOL. XIV.

CINCINNATI, APRIL, 1891

NO. 1.

PROCEEDINGS.

REGULAR MEETING, January 6, 1891.

President Abert in the chair.

The minutes of the December meeting read and approved.

Miss Lida J. Brown, Dr. Chas. T. Phythian, Bert W. Williamson and S. Marcus Fechheimer were elected active members.

The minutes of the Executive Board for November were read.

The resignations of Miss Ida Murdoch and Dr. Mary E. Osborn were read and accepted.

The death of Dr. John Davis was announced.

Mr. Davis L. James read by title two papers, one on North American Fungi, by A. P. Morgan; the other entitled a Manual of the Paleontology of the Cincinnati Group, by Jos. F. James.

Dr. Henshall read by title a paper on the Birds of Warren County, Ohio, by Raymond W. Smith.

Col. J. W. Abert, the President, then addressed the Society on (1) The Trend of Mountain Chains; (2) The Torsion of the Earth; (3) The Theory of Hot Springs.

Mr. Skinner asked whether the diurnal variation of the magnetic needle was not apparent rather than real, which was discussed by himself and Mr. Latham Anderson.

A photograph of a leaf insect from Central America, donated by Mr. T. H. Aldrich, was exhibited.

Adjourned.

REGULAR MEETING, February 3, 1891.

President Abert in the chair.

Minutes of January meeting read and approved.

Mrs. James LeBoutillier, Sr., Mrs. Mamie Hall, George Gregg Johnston, Alexander Starbuck and James Brown Kemper were proposed for active membership.

On motion of Mr. A. D. Smith, the rules were suspended and Mrs. Mamie Hall was elected an active member.

On motion of Mr. J. Ralston Skinner, the attention of the Photographic Section was to be called, by the Secretary, to the spilling of water on the floor of the dark room and the danger of the same to the ceiling of the auditorium..

The minutes of the Executive Board for December were read.

The resignations of Drs. A. Hoeltge and A. C. Kemper were read and accepted.

The Secretary read by title a paper entitled: "Notes on the Batrachians and Reptiles of Vigo County, Indiana, by Prof. W. S. Blatchley.

Mr. Chas. Dury exhibited two specimens of Mot-mots from Central America, and made some interesting remarks concerning the habits of the species in denuding and mutilating their tail feathers, and of their peculiar and anomalous habit of living in holes in the ground.

Mr. David W. Miller then read a paper, "On the influence of Ocean Currents in the formation of Continents," which commanded the close attention of those assembled.

Mr. Chas. Dury read by title a paper by Mr. A. W. Butler, entitled, "Contribution to Indiana Herpetology No. 3."

Adjourned.

REGULAR MEETING, March 3, 1891.

A quorum not being present, owing to the inclemency of the weather, an informal meeting was held to pass resolutions

respecting the memory of Mr. Chas. F. Low and Mr. S. E. Wright, two members of the Society recently deceased.

The following members were present: Messrs. Skinner, Langdon, James, Tally, Peck and Henshall.

On motion, Mr. J. R. Skinner took the chair, and stated the object of the meeting.

The following committees were appointed: On the death of Mr. C. F. Low, Messrs. Langdon, James and Talley; on the death of Mr. S. E. Wright, Messrs. James, Talley and Langdon.

The following resolutions were adopted, subject to approval of next regular Society meeting:

REPORT ON MR. LOW.

Mr. Charles F. Low, who was favorably and widely known among scientists for his researches in the departments of American history, archæology and ethnology, died at his home in Madisonville, Ohio, February 26, 1891, after a short illness of acute pneumonia, at the age of fifty-three.

Mr. Low was born at Providence, R. I., April 22, 1837, and often referred to his early life as a boy along the sea coast. In 1856 he came west to Athens, Ohio, and finally located at Chillicothe during the same year, where he became connected with the M. & C., now B. & O. S. W. R. R. Co., with which company he remained during all its various changes of name and ownership, up to the time of his last illness—a continuous period of thirty-four years' service, during which time he rose from a clerk in the office to the position of Auditor, and finally Secretary-in-Chief. In 1858 he married Miss Mary Augusta McClintick, of Chillicothe, who, with eight children, five sons and three daughters, survives him.

Deceased was a scholarly man, well read in the subjects above mentioned, and especially noted for his effective labors, both in the field and with the pen, in connection with the development and exploration of the "Madisonville Prehistoric Cemetery," situated on the Ferris farm, near the town mentioned. The publications of that work, mainly the product of his pen, are to be found in the JOURNAL of this Society for 1880. Mr. Low became a member of this Society in 1878,

and served on its executive board for two years. While his residence out of town precluded frequent attendance at the evening meetings, he was prompt and regular in his executive board duties, and numbered among the active members of this Society many warm and appreciative friends. He was also one of the founders of the Literary and Scientific Society of Madisonville, the body which inaugurated and carried on successfully about two years, unaided, the original explorations above referred to.

In December, 1890, he, in company with his wife, visited Southern California for a period of recreation, and while there made extensive collections and investigations into the geology, conchology and archæology of that section. Shortly after his return he was seized with his fatal illness.

In his death this Society loses a valued member and contributor to its journal; his family a loving and indulgent husband and father; his personal associates a warm and cultured friend, and the community a most honorable and useful citizen,

Respectfully,

F. W. LANGDON,
DAVIS L. JAMES,
GEO. L. TALLEY,
Committee.

REPORT ON MR. S. E. WRIGHT.

In the death of Mr. Smithson E. Wright, the Society has lost one of its most trusted and valued members. Mr. Wright became a member of the Society in 1872, a year or two after its organization, and was elected trustee and manager of the funds of the Society, as well as its treasurer. He filled these positions to the satisfaction and welfare of the organization for the period of eighteen years, when, because of the infirmities naturally attending his advanced age, he felt it necessary to decline the position he had so worthily and acceptably filled. The sympathy of the Society is respectfully tendered to his family in their bereavement.

DAVIS L. JAMES,
GEO. W. TALLEY,
F. W. LANGDON,

The meeting then adjourned

Committee.

NORTH AMERICAN FUNGI.

BY A. P. MORGAN.

Fourth Paper.

(Continued from Vol. XII., p. 172.)

(Read January 6, 1891.)

THE GASTROMYCETES.

Genus IX.—LYCOPERDON, Tourn.

Mycelium fibrous, rooting from the base. Peridium small, globose, obovoid or turbinate, with a more or less thickened base; cortex a subpersistent coat of soft spines, scales, warts, or granules; inner peridium thin, membranaceous becoming papyraceous, dehiscent by a regular apical mouth. Subgleba cellulose, continuous above with the capillitium, rarely definitely limited; capillitium originating from the inner surface of the peridium and from the subgleba; the threads long, slender, simple or branched, the thickness of the main stem commonly about equal to the diameter of the spores, the branches tapering; spores small, globose rarely oval or elliptic, even or warty, mostly sessile or with only a minute pedicel, but usually accompanied by the deciduous sterigmata. Plate I, Fig. 1.

Puffballs of small size, growing on the ground in fields and woods; only two or three species grow on old trunks of trees and one grows on mosses. The peridium is usually furnished with a distinct cellulose base underneath the gleba; in a few species the subgleba is nearly or quite obsolete. The threads of the capillitium usually appear in two distinct sets, first those which grow inward from the wall of the peridium, secondly those that arise from the subgleba; the latter are often much elongated toward the center and present a thick tuft rising toward the apex of the peridium, which has been termed the columella. The capillitium threads are mostly colored and are thicker than the fine hyaline densely inter-

woven hyphae which compose the wall of the peridium; but they seem to me generally branches of the latter and hence fixed at one extremity and free at the other. Possibly free threads are to be found, at least in some of the species, among those which proceed from the subgleba; but if so, they are generally too long and involved to be easily segregated.

TABLE OF SPECIES OF LYCOPERDON.

§1. PURPLE - SPORED SERIES. Mature spores purplish brown.

- a.* Cortex consisting of very long convergent spines 1, 2.
- b.* Cortex composed of long slender convergent spines 3, 4.
- c.* Cortex composed of minute spinules 5, 6, 7.
- d.* Cortex a furfuraceous persistent coat 8, 9, 10.
- e.* Cortex a smooth continuous layer, becoming areolate 11, 12.

§2. OLIVE-SPORED SERIES. Mature spores usually brownish-olivaceous.

A. Peridium obovoid or turbinate, the subgleba well developed.

f. Cortex of long spines mingled with shorter ones, the former at length fall away, leaving a reticulate surface to the inner peridium 13, 14.

g. Cortex of stout spines which fall away and leave a tomentose or furfuraceous surface to the inner peridium 15, 16.

h. Cortex of long spines, curved and convergent at the apex, which fall away and leave a smooth surface to the inner peridium 17, 18, 19, 20.

i. Cortex of minute spinules and granules or furfuraceous scales. Terrestrial. 21, 22, 23.

k. Cortex of minute spinules, scales or granules. Lignatile 24, 25.

B. Peridium very small, globose, the subgleba nearly obsolete.

l. Cortex a thin coat of minute spinules, scales or granules 26-31.

§1. PURPLE-SPORED SERIES. Mass of spores and capillitium immediately after deliquescence, usually olivaceous, then changing to violet or brownish-purple, and finally to purplish-brown; the threads branched, rarely simple, the main stem with a thickness about equal to the diameter of the spores, the branches long, slender and tapering, bright purplish-brown in color by transmitted light; the spores globose, distinctly warted, mostly sessile, but always accompanied by the long hyaline sterigmata, which persist along with them after deliquescence, sometimes some of them pedicellate; when fully matured dark purplish-brown in color and opaque.

a. Cortex consisting of very long convergent spines.

1. *L. ECHINATUM*. Pers. Peridium broadly obovoid, sometimes much depressed, usually with a narrow short and pointed base; mycelium of long, slender white fibers. Cortex composed of very long brown spines, converging and often coherent at the apex, with minute scurfy spinules intervening; the long spines at length fall away, at least from the upper part of the peridium, leaving the pale brown inner peridium ornamented with an elegant net-work of dark brown reticulations; these finally disappear, leaving behind a smooth pale-brown shining surface. Subgleba occupying about a third part of the peridium, sometimes quite shallow; mass of spores and capillitium olivaceous, then violet to brownish-purple; the threads much branched, the main stem nearly as thick as the spores, the branches long, slender and tapering; spores globose, distinctly warted, 5-6 mic. in diameter. Plate I, Fig. 5.

Growing on the old leaves in dense woods. New York, Peck; Pennsylvania, Schweinitz; Ohio, Morgan; Wisconsin, Trelease. Peridium $\frac{3}{4}$ -1 $\frac{1}{2}$ inches in diameter, scarcely more than an inch in height. My specimens, which are abundant, agree exactly with European specimens of *L. echinatum*, Pers; furthermore *L. constellatum*, Fr., does not appear to be separable as a distinct species.

2. *L. PULCHERRIMUM*, B. & C. Peridium usually obovoid, sometimes subturbinat. with a short stout base; the mycelium forming a thick cord-like root. Cortex consisting of very long

white spines, converging and often coherent at the apex; the spines at length fall away from the upper part of the peridium, leaving the inner peridium with a smooth purplish-brown shining surface, sometimes faintly reticulated. Subgleba occupying about a third part of the peridium; mass of spores and capillitium at first olivaceous, then brownish-purple; the threads much branched, the main stem thicker than the spores, the branches long, slender and tapering; spores globose, minutely warted, 4.5-5.5 mic. in diameter. Plate I, Fig. 3.

Growing in low grounds, in fields and woods. New England, *Frost*; Pennsylvania, *Michener*; Maryland, *James*; Ohio, *Morgan*; Wisconsin, *Trelease*; Iowa, *McBride*; Nebraska, *Webber*; Kansas, *Cragin*. Peridium 1-2½ inches in diameter and 1-2 inches in height. I have accepted this name of the species on the assurance of Prof. Trelease, for the original description of Berkeley is certainly quite inapplicable. It has hitherto been generally known as *L. Frostii*, Peck. *L. rima-spinorum*, Cragin, does not appear to differ essentially. *L. asperrium*, W. & C., of the Pacific Coast Catalogue, is quite likely another name applied to this species; and if this is truly the species of the Fungi Angolenses it is a still older name than the one here adopted. The fresh specimens of this plant have a strong and not unpleasant fragrance.

b. Cortex composed of long, slender convergent spines.

3. *L. HIRTUM*, Mart. Peridium broadly turbinate, depressed above, contracted below into a short, thick, tapering or pointed base, with a cord-like root. Cortex a dense coat of soft spines, long, slender and convergent above, becoming shorter downward. gray or brownish in color; these finally fall away, leaving the inner peridium with a brown or purplish-brown smooth, shining surface. Subgleba occupying from one-third to one-half of the peridium; mass of spores and capillitium olivaceous, then brownish-purple; the threads branched, the main stem about as thick as the spores, with slender, tapering branches; spores globose, distinctly warted, 5-6 mic. in diameter. Plate I, Fig. 2.

Growing on the ground in woods. Peridium 1-2½ inches in diameter and 1½-2 inches in height. This species in this

country heretofore has been included with *L. atropurpureum*. I have followed Mr. Masee in keeping them separate. This is perhaps *L. bicolor*, W. & C., of the Pacific Coast Catalogue.

4. *L. ATROPURPUREUM*, Vitt. Peridium subglobose, often irregular, plicate and lacunose underneath, with a fibrous mycelium. Cortex of slender spines or hairs, long and convergent above, becoming shorter below, gray or brownish above and whitish underneath; these at length fall away, leaving a smooth, shining, pale-brown or purplish surface to the inner peridium. Subgleba broad and shallow, scarcely occupying a third part of the peridium, sometimes nearly obsolete; mass of spores and capillitium olivaceous, then brownish-purple; the threads branched, the main stem about as thick as the spores, with long, slender, tapering branches; spores globose, distinctly warted, 5.5-6.5 mic. in diameter.

Growing on the ground in woods. New York, *Peck*; South Carolina, *Atkinson*; Ohio, *Morgan*; Wisconsin, *Trelease*. Peridium 1-2 inches in diameter. This is possibly the *L. unbrinum* of Schweinitz, N. A. Fungi.

c. Cortex composed of minute spinules.

5. *L. CUPRICUM*, Bon. Peridium obconic, depressed above and tapering downward, the base plicate, with a fibrous mycelium. Cortex gray or flesh-color, composed of minute spinules circularly arranged and convergent and coherent at the apex; these dry up, becoming dark purplish in color, and finally fall away from the smooth, shining, copper-colored surface of the inner peridium. Subgleba occupying nearly a third part of the peridium; mass of spores and capillitium, at length purplish brown; the threads branched, the main stem thinner than the spores, with long, tapering branches; spores globose, distinctly warted, 6-7 mic. in diameter.

Growing in sandy soil in woods. New Jersey, *Ellis*. Peridium about 1 inch in diameter and an inch or more in height. The microscopic features are given from specimens received from Mr. Ellis.

6. *L. ASTEROSPERMUM*, D. & M. Peridium obovoid or pyriform, the base short and pointed, with a slender fibrous mycelium. Cortex a thin coat of minute spinules with inter-

mingled granules, gray or brownish above, paler below; these dry up and are a long time persistent, but they finally fall away, leaving the inner peridium with a pale brown, smooth, shining surface. Subgleba obconical, occupying nearly a third part of the peridium; mass of spores and capillitium olivaceous, then brownish-purple; the threads about as thick as the spores, with slender tapering branches; spores globose, distinctly warted, 5.5-6.5 mic. in diameter.

Growing on the ground in open woods. Ohio, *Morgan*; Nebraska, *Webber*. Peridium 1-1½ inches in diameter. A very pretty species of regular form; its glossy cortex is quite persistent.

7. *L. DELICATUM*, Berk. Peridium subglobose, plicate underneath, with a fibrous mycelium. Cortex a thin coat of minute spinules and granules, gray or brownish above, whitish below, finally falling away from the smooth, shining, pale or brownish surface of the inner peridium. Subgleba very small or quite obsolete; mass of spores and capillitium olivaceous, then pale or purplish-brown; the threads rather thinner than the spores, with slender tapering branches; spores globose, distinctly warted, 5-6 mic. in diameter.

Growing on the ground. Pennsylvania, *Gentry*. Peridium 1-2 inches in diameter.

d. Cortex a furfuraceous persistent coat.

8. *L. GLABELLUM*, Peck. Peridium obovoid with a short pointed base or turbinate, with a narrow tapering base; the mycelium slender, fibrous. Cortex a soft delicate flocculose covering, white cream-color or yellow, which dries up at maturity to a thin furfuraceous persistent coat, scarcely abraded in occasional patches disclosing the pale, smooth, shining surface of the inner peridium. Subgleba occupying nearly a third part of the peridium; mass of spores and capillitium pale olivaceous, then pale brown or finally purplish-brown; the threads about as thick as the spores, with slender tapering branches; spores globose, distinctly warted, 5-6 mic. in diameter. Plate I, Fig. 7.

Growing on the ground in woods. New England, *Frost*; New York, *Peck*; Ohio, *Morgan*; Wisconsin, *Trelease*. Peridium 1-1½ inches in diameter and about the same in

height. A beautiful species, regular in form, soft to the touch and attractive in color.

9. *L. ELONGATUM*, Berk. Peridium globose above, contracted below into a stout thick base, more or less elongated and cylindric or tapering downward; mycelium composed of thick fibers. Cortex a loose flocculose white or yellowish coat, drying up into a mealy or furfuraceous persistent layer, which scarcely reveals the pale shining surface of the inner peridium. Subgleba occupying more than half the interior of the peridium; mass of spores and capillitium pale olivaceous, then pale brown or finally purplish; the threads much branched, the main stem much thicker than the spores, the branches tapering; spores globose, distinctly warted, 5.5-6.5 mic. in diameter.

Growing on the ground in damp woods. Ohio, *Morgan*. Peridium 1-2 inches in diameter and 2-3 inches in height, the base $\frac{3}{4}$ -1 inch in thickness. In form it somewhat resembles *L. gemmatum*, but it has a cortex like that of *L. glabellum*. Perhaps Trelease's Figure 2, Plate IX, is referable to this species.

10. *L. ELEGANS*, Morg. n. sp. Peridium large, depressed globose, plicate underneath and sometimes with a narrow umboniform base, which is continuous with the thick root. Cortex at first flocculose, white or yellowish, drying up into a dense furfuraceous persistent coat, which becomes ochraceous or brownish in color, and sometimes obscurely areolate. Subgleba broad, convex above, occupying a third part or more of the peridium; mass of spores and capillitium, olivaceous, then pale-brown or finally purplish-brown; the threads much branched, the main stem thicker than the spores, the branches long and tapering; spores globose, distinctly warted, 5-6 mic. in diameter. Plate I, Fig. 4.

Growing on rich soil on the open prairie about Iowa City, Iowa, *Prof. T. H. McBride*. Peridium $1\frac{1}{2}$ -3 inches in diameter. In form and size this species somewhat resembles *Calvatia fragilis*, but the threads are arranged in two sets as in *Lycoperdon*; the cortex is similar to that of *L. glabellum*; the mycelium forms a remarkably thick root.

e. Cortex a smooth continuous layer, becoming areolate.

11. *L. RIMULATUM*, Peck. Peridium depressed—globose or broadly obovoid, plicate underneath with a slender fibrous mycelium. Cortex at first a thin, smooth, continuous fibrillose layer, gray or bluish-gray, sometimes with a purplish tinge; this at length breaks into a network of fine lines or fissures, gradually dries up into minute thin adnate scales, and finally falls away from the smooth grayish or purplish-brown surface of the inner peridium. Subgleba broad, but distinct, plane above, occupying about a fourth part of the peridium; mass of spores and capillitium purplish-gray, then brownish-purple; the threads simple or scarcely branched, variable in thickness, but always thinner than the spores; spores globose, distinctly warted, 6-7 mic. in diameter, often pedicellate. Plate I, Fig. 6.

Growing on the ground in fields and open woods. New York, *Peck*; South Carolina, *Atkinson*; Ohio, *Morgan*; Wisconsin, *Trelease*. Peridium $\frac{3}{4}$ -1 $\frac{1}{2}$ inches in diameter, scarcely an inch in height.

12. *L. VELATUM*, Vitt. Peridium globose or obovoid, with a cord-like root. Cortex white or yellowish, at first a thickish continuous layer, then breaking up into circular or irregular persistent patches with fimbriate margins. Subgleba occupying about a third part of the peridium; mass of spores and capillitium olivaceous, then purplish-brown; the threads branched, the main stem nearly as thick as the spores, the branches long and tapering; spores globose, distinctly warted, 5-6 mic. in diameter.

Growing on the ground in woods. South Carolina, *Ravenel*. Peridium 1-2 inches in diameter.

§2. OLIVE-SPORED SERIES. Mass of spores and capillitium immediately after deliquescence greenish-yellow, becoming when mature pale or brownish olivaceous, sometimes pale brown, rarely gray or argillaceous; the threads simple or branched, usually olivaceous in color by transmitted light, with a thickness about equal to the diameter of the spores, in a few species hyaline and two to three times as thick as the spores; the spores globose, rarely oval or elliptic, even or minutely warted, mostly sessile or with only a minute pedicel, rarely with a long persistent pedicel, often accompanied by the short hyaline sterigmata or their fragments.

A. Peridium obovoid or turbinate, the subgleba well developed.

f. Cortex of long spines mingled with shorter ones; the former at length fall away, leaving a reticulate surface to the inner peridium.

13. *L. GEMMATUM*, Batsch. Peridium turbinate, depressed above, the base short and obconic or more elongated and tapering or subcylindric, arising from a fibrous mycelium. Cortex consisting of long, thick, erect spines or warts of irregular shape, with intervening smaller ones, whitish or gray in color, sometimes with a tinge of red or brown; the larger spines first fall away, leaving pale spots on the surface, and giving it a reticulate appearance. Subgleba variable in amount, usually more than half the peridium; mass of spores and capillitium greenish-yellow, then pale brown; threads simple or, scarcely branched, about as thick as the spores; spores globose, even or very minutely warted, 3.5-4.5 mic. in diameter.

Growing on the ground and sometimes on rotten trunks in woods, often cæspitose. New England, *Frost*; New York, *Peck*; New Jersey, *Ellis*; Pennsylvania, *Gentry*; Maryland, *James*; North Carolina, *Curtis*; South Carolina, *Atkinson*; Ohio, *Lea*; Wisconsin, *Trelease*; Kansas, *Cragin*; California, *Harkness*. Found in every part of the world. Peridium 1-2 inches in diameter and 1-3 inches in height. This species is distinguished from all others by the peculiar large erect terete spines or warts, the so-called gems which stud its upper surface.

14. *L. PERLATUM*, Pers. Peridium turbinate, broad and depressed above, plicate underneath and contracted into a short and pointed or sometimes elongated and tapering base; mycelium fibrous. Cortex of long slender spines, mingled with smaller spinules and warts, gray brown or blackish in color; the longer spines first fall away, leaving a reticulate surface to the inner peridium. Subgleba occupying one-third to one-half of the peridium; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; the threads mostly simple, some of them thicker than the spores; spores globose, even or very minutely warted, 3.5-4.5 mic. in diameter.

Growing on the ground in woods. New York, *Peck*; Maryland, *James*. Peridium 1-2 inches in diameter and 1-2 inches in height. This is *L. gemmatum* var. *hirtum* of Peck's U. S. species of *Lycoperdon*.

g. Cortex of stout spines which fall away and leave a tomentose or furfuraceous surface to the inner peridium.

15. *L. EXCIPULIFORME*, Scop. Peridium turbinate, depressed above, plicate below and contracted into a more or less elongated base. Cortex of large stout spines, convergent above, becoming smaller downward, which at length fall away, leaving a tomentose surface to the inner peridium. Subgleba occupying one-half or more of the peridium; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; the threads about as thick as the spores, scarcely branched; spores globose, minutely warted, 4-5 mic. in diameter.

Growing on the ground in meadows and woods. Pennsylvania, North Carolina, *Schweinitz*; Canada, *Saccardo*. Peridium 1-2 inches in diameter and 1-4 inches in height.

16. *L. SEPARANS*, Peck. Peridium broadly obovoid, often much depressed, plicate underneath, with a cord-like root. Cortex a dense coat of stout white convergent spines; after maturity these peel off in flakes or patches, revealing a thin furfuraceous layer of minute yellowish to pale or dark brown scales, covering the surface of the inner peridium; these also gradually disappear, leaving a pale, smooth, shining surface. Subgleba broad, occupying about a third part of the peridium, definitely limited above; mass of spores and capillitium pale to dark brown; the threads variable in thickness, but some of them thicker than the spores, scarcely branched; spores globose, even, 3.5-4 mic. in diameter. Plate II, Fig. 1.

Growing on the ground in pastures and meadows. New England, *Frost*; New York, *Peck*; South Carolina, *Atkinson*; Ohio, *Morgan*; Wisconsin, *Trelease*. Peridium 1-2 inches in diameter and about 1 inch in height. This is *L. separans* of Peck's 26th N. Y. Report and *L. Wrightii* var. *separans* of Peck's U. S. species of *Lycoperdon*. It is also no doubt *L. calvescens*, B. & C. Specimens of it may have been referred to

L. cruciatum, Rostk., but this species is said to grow on trunks of pines, and hence must be something different.

h. Cortex of long spines, curved and convergent at the apex, which fall away and leave a smooth surface to the inner peridium.

17. *L. PEDICELLATUM*, Peck. Peridium globose or broadly obovoid, with a slender fibrous mycelium. Cortex gray or whitish, changing to dirty-brown, consisting of long spines convergent at the apex; these at length fall away, leaving a wrinkled or obscurely pitted surface to the pale glabrous inner peridium. Subgleba rather small, occupying scarcely more than a fourth part of the peridium; mass of spores and capillitium olivaceous, then brownish; the threads much branched, the main stem thicker than the spores, the branches tapering; spores globose, even, 3.5-4.5 mic. in diameter, with long persistent pedicels. Plate II, Fig. 2.

Growing on the ground and on rotten wood in woods. New York, *Peck*; Alabama, *Atkinson*; Ohio, *Morgan*; Wisconsin, *Trelease*. Peridium $\frac{3}{4}$ -1 $\frac{1}{2}$ inches in diameter. The long persistent pedicels to the spores are the marked feature of this species; they do not break off and fall away in time, as in other species of *Lycoperdon*.

18. *L. PECKII*, Morg. Peridium obovoid, with a slender fibrous mycelium. Cortex whitish, ochraceous or brownish, sometimes with a reddish tinge, composed of long spines, usually curved and convergent at the apex; these finally fall away, leaving a pale, smooth surface to the inner peridium. Subgleba scarcely a third part of the peridium; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; the threads rather thinner than the spores, scarcely branched; spores globose, minutely warted, 4-5 mic. in diameter.

Growing on the ground or on decaying wood in woods. New York, *Peck*; New Jersey, *Ellis*; Alabama, *Atkinson*; Ohio, *Morgan*. Peridium 1-1 $\frac{1}{2}$ inches in diameter. This is *L. echinatum* of Peck's U. S. species of *Lycoperdon*.

19. *L. EXIMIUM*, Morg. n. sp. Peridium obovoid, with a fibrous mycelium. Cortex white or brownish, composed of long slender spines, often curved and convergent at the apex, which at length fall away from above downward, leaving a

pale, smooth surface to the inner peridium. Subgleba small, occupying scarcely more than a fourth part of the peridium; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; the threads mostly thinner than the spores, much branched; spores oval, even, $5-6 \times 4-4.5$ mic., usually furnished with a short pedicel. Plate II, Fig. 3.

Growing on the ground in sandy soil. South Carolina, *Prof. Geo. F. Atkinson*. Peridium $\frac{3}{4}$ - $1\frac{1}{2}$ inches in diameter and about 1 inch in height. This species is readily distinguished by its large oval spores.

20. *L. CURTISII*, Berk. Peridium globose, with a very short rooting base and a slender fibrous mycelium. Cortex consisting of a pale yellowish farinaceous layer, covered by a coat of soft, fragile white spines, curved and convergent at the apex; after maturity it soon disappears, leaving a pale smooth surface to the inner peridium. Subgleba small, but distinct, convex above and definitely limited; mass of spores and capillitium greenish-yellow, then pale olivaceous; the threads long; simple, hyaline, two to three times as thick as the spores; spores globose, even, 3.5-4 mic. in diameter. Plate II, Fig. 4.

Growing gregariously, and sometimes cæspitously, on the ground, in meadows, pastures and even in cultivated fields. New England, *Wright*; New York, *Peck*; Maryland, *James*; Carolina, *Atkinson*; Ohio, *Morgan*; Wisconsin, *Trelease*; Kansas, *Kellerman*. Peridium $\frac{3}{8}$ - $\frac{3}{4}$ of an inch in diameter. This is *L. Wrightii* var. *typicum* of Peck's U. S. species of *Lycoperdon*. The peculiar characteristic of the species is the hyaline threads of the capillitium; although they are of large diameter, yet the walls are very thin and the threads collapse in drying.

i. Cortex of minute spinules and granules or furfuraceous scales.

*Terrestrial.

21. *L. MUSCORM*, Morg. Peridium turbinate, globose or depressed-globose above, contracted below into a stem-like base, with a filamentous and fibrous mycelium. Cortex a thin white or yellowish coat of minute spinules with intermingled granules, which are coarser toward the apex; these wither or shrivel with age and are mostly persistent on the smooth

olive-brown shining surface of the inner peridium. Subgleba occupying little more than the stem-like base; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; spores minutely warted, 4-4.5 mic. in diameter.

Growing among mosses, especially *Polytrichum*, in old meadows and pastures. New York, *Peck*. Peridium $\frac{1}{2}$ -1 $\frac{1}{3}$ inches in diameter and 1-3 inches in height. This is *L. molle* of *Peck's* U. S. species of *Lycoperdon*. "From the long-stemmed puff-ball (*Calvatia elata*) it is with difficulty separated in its immature state, but when mature the different manner in which the peridium in the two species ruptures will at once distinguish them. From its habit of growing among mosses the stem is often elongated, and is sometimes very slender in proportion to the size of the peridium."

22. *L. TURNERI*, E. & E. Peridium obovoid, somewhat depressed above, plicate underneath, with a mycelium of rooting fibers. Cortex white, often gray or brownish above, consisting of minute spinules with intermingled granules; these after maturity dry up and are quite persistent, forming a minutely scabrous coat on the olive-brown shining surface of the inner peridium. Subgleba broad and shallow, scarcely occupying more than a fourth part of the peridium; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; the threads with the main stem about as thick as the spores, and long tapering branches; spores globose, minutely warted, 4-5 mic. in diameter, mostly with a short pedicel. Plate II, Fig. 5.

Growing on the ground in woods. Labrador, *Mr. L. M. Turner*; New Jersey, *Ellis*; New England, *Humphrey*; New York, *Underwood*; Carolina, *Atkinson*; Ohio, *Morgan*; Wisconsin, *Brown*. Peridium 1-2 inches in diameter and 1-2 inches in height. A very pretty puff-ball with a silky shining coat.

23. *L. MOLLE*, Pers. Peridium turbinate, depressed above, abruptly contracted into a short thick base, with a fibrous mycelium. Cortex a thin, mealy-furfuraceous, subpersistent coat, white or yellowish, passing into buff; when this finally falls away it discloses a smooth, shining, pale olivaceous surface to the inner peridium. Subgleba occupying about a third part of the peridium; mass of spores and capillitium greenish-yellow, then brownish olivaceous; the

threads about as thick as the spores, branched; spores globose, very minutely warted, 3.5-4.5 mic. in diameter, with a minute pedicel.

Growing on the ground in open woods and pastures. Wisconsin, *Trelease*. Peridium $\frac{1}{2}$ - $1\frac{1}{4}$ inches in diameter and $\frac{3}{4}$ - $1\frac{1}{2}$ inches in height. "This species superficially resembles small plants of *L. glabellum* so closely that it is difficult to distinguish them." The spores, however, "afford constant and certain means of distinguishing them."

k. Cortex of minute spinules scales or granules,

** Lignatile.

24. L. PYRIFORME, Schaeff. Peridium obovoid or pyriform, with an abundant mycelium of very long white branching fibers. Cortex a thin coat of minute scales or granules or short stout spinules, whitish gray or brownish; it is quite persistent, drying up and becoming reddish-brown in color and often rivulose or areolate. Subgleba small, white, quite compact, the cells minute; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; threads thicker than the spores, branched, those in the center very long and forming a dense tuft; spores globose, even, 3.5-4.5 mic. in diameter.

Growing on old timber or sometimes on the ground; usually caespitose, sometimes in dense clusters several feet in extent. New England, *Frost*; New York, *Peck*; Pennsylvania, *Schweinitz*; North Carolina, *Curtis*; Ohio, *Lea*; Wisconsin, *Trelease*; Kansas, *Cragin*; California, *Harkness*. Peridium $\frac{3}{4}$ - $1\frac{1}{4}$ inches in diameter and 1-2 inches in height. The commonest of all puff-balls, distributed throughout the whole world.

25. L. SUBINCARNATUM, Peck. Peridium globose, sessile, with a mycelium of long branching white fibers. Cortex pinkish-brown, composed of minute short stout spinules, which fall away after maturity, leaving the surface of the inner peridium deeply pitted. Subgleba quite small, but usually distinct; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; threads long, simple, hyaline, once to twice as thick as the spores; spores globose, minutely warted, 4-4.5 mic. in diameter. Plate II, Fig. 6.

Growing in woods on old trunks. New York, *Peck*; Pennsylvania, *Gentry*; Ohio, *Morgan*; Wisconsin, *Brown*. Peridium $\frac{3}{4}$ – $1\frac{1}{4}$ inches in diameter. A singular species well marked by its very distinctly pitted inner peridium, the little pits resembling those in a thimble. It is also one of the few species with simple hyaline threads.

B. Peridium very small, globose; the subgleba nearly obsolete.

1. Cortex a thin coat of minute spinules, scales or granules.

26. L. WRIGHTII, B. & C. Peridium globose, sessile, with a fibrous mycelium. Cortex a thin, whitish, minutely fibrillose-spinulose coat, the spinules often convergent at the apex, drying up and quite persistent on the pale brown surface of the inner peridium. Subgleba obsolete; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; the threads variable in thickness, sparingly branched; spores globose, even or very minutely warted, 3.5–4.5 mic. in diameter, often with a minute pedicel.

Growing on the ground in woods. New England, *Wright*; New Jersey, *Ellis*; Ohio, *Morgan*. Peridium $\frac{1}{2}$ – $\frac{3}{4}$ of an inch in diameter.

27. L. PUSILLUM, Batsch. Peridium globose, sessile, with a slender cord-like root. Cortex a thin whitish furfuraeous coat, drying up into minute squamules which are quite persistent on the pale brown surface of the inner peridium. Subgleba obsolete; mass of spores and capillitium greenish-yellow, then brownish-olivaceous; the threads very much branched, the main stem about as thick as the spores, the branches tapering; spores globose, even, 3.5–4 mic. in diameter, often with a minute pedicel. Plate II, Fig. 7.

Growing on the ground in fields and open woods. New York, *Peck*; North Carolina, *Curtis*; Ohio, *Morgan*; Wisconsin, *Trelease*; Kansas, *Cragin*. Peridium $\frac{3}{8}$ – $\frac{3}{4}$ of an inch in diameter.

28. L. OBLONGISPORUM, B. & C. Peridium subglobose, with a slender mycelial cord. Cortex a thin, whitish, furfuraeous coat, drying up into minute persistent granules on the pale brown surface of the inner peridium. Subgleba nearly

obsolete; mass of spores and capillitium olivaceous, then brown; threads much branched, the main stem about as thick as the spores, the branches tapering; spores elliptic, even, $5-6 \times 3-4$ mic., sometimes with a minute pedicel.

Growing on the ground in dense woods. Wisconsin, *Trelease*. Peridium $\frac{3}{8}$ -1 inch in diameter. "This pretty species previously known only from Cuba, is indistinguishable from *L. pusillum* when immature, the spores affording the only really characteristic feature."

29. *L. CEPÆSFORME*, Bull. Peridium globose or depressed-globose, plicate underneath, with a cord-like root. Cortex at first a thin, white, minutely furfuraceous coat, this soon becomes rimulose and at length breaks up into small scales and patches, which finally disappear from the pale or pale-brown surface of the inner peridium. Subgleba nearly obsolete; mass of spores and capillitium greenish-yellow, then pale-olivaceous; the threads very much branched, the main stem thicker than the spores, the branches long and tapering; spores globose, even, 3.5-4 mic. in diameter, often with a minute pedicel. Plate II, Fig. 9.

Growing on the ground in meadows and pastures. Pennsylvania and Carolina, *Schweinitz*; Alabama, *Atkinson*; Ohio, *Morgan*. Peridium $\frac{1}{2}$ -1 inch in diameter. Fries appears to have included this species with *L. pusillum*, and the smaller forms are certainly very liable to be referred to that species. Saccardo includes these species and two or three others under *L. furfuraceus*, Schaff. We have been guided by Masee and Quelet. *L. pratense* of Schweinitz's N. A. Fungi we take to be this species.

30. *L. COLORATUM*, Peck. Peridium, subglobose, plicate underneath, with a fibrous mycelium. Cortex a thin coat of very minute persistent granules, whitish or yellow, becoming reddish or pale brown, or finally dark brown with age. Subgleba nearly obsolete; mass of spores and capillitium at first pale yellow, then brownish-olivaceous; threads very much branched, the main stem thicker than the spores, the branches tapering; spores globose, even, 3.5-4.5 mic. in diameter, often with a minute pedicel. Plate II, Fig. 10.

Growing in low grounds in woods. New England, *Morgan*; New York, *Peck*; Ohio, *Morgan*; Wisconsin, *Trelease*. Peridium $\frac{3}{8}$ -1 inch in diameter.

31. *L. ACUMINATUM*, Bosc. Peridium globose, then ovoid, with a mycelium of fine white fibers. Cortex a white soft delicate continuous coat, drying up into a thin furfuraeous persistent layer on the surface of the inner peridium. Subgleba obsolete; mass of spores and capillitium pale-olivaceous, then dirty gray; threads simple, hyaline, two to three times as thick as the spores; spores globose, even, 3 mic. in diameter. Plate II, Fig. 8.

Growing on the mosses of old logs and about the base of living trees. New York, *Peck*; North Carolina, *Curtis*; South Carolina, *Revenel*, *Atkinson*; Ohio, *Morgan*; Costa Rica, *Oersted*. Peridium $\frac{1}{4}$ – $\frac{1}{2}$ of an inch in height. The peridium is at first globose, the ovoid form appears with the formation of the mouth; both forms may be seen on the same patch of moss. This species was first described under this name in the *Novae Symbolae* of Fries; it next appears under the same name in Curtis's Catalogue, but incorrectly ascribed to B. & C. *L. calyptraeforme*, Berk, and *L. leprosum*, B. & Rav., are synonyms of this.

NOTES ON THE BATRACHIANS AND REPTILES OF VIGO COUNTY, INDIANA.

BY W. S. BLATCHLEY.

(Read by Title February 3, 1891.)

For the past three years the writer has given especial attention to the Batrachians and Reptiles found in the vicinity of Terre Haute, Vigo County, Indiana. In that time forty-six species and six sub-species of these interesting vertebrates have been observed in the locality mentioned, and many notes have been taken relating to their habits, the causes of their local distribution, etc.

Believing that a list of those seen, together with some of the notes, would prove acceptable to persons interested in the study of herpetology, the present paper has been prepared.

Vigo County lies on the western border, and almost midway between the northern and southern boundaries of the State. The Wabash River flows through its north-western part, and in many places its bottoms, which are usually overflowed each season, are one to two miles in width.

In these bottoms are a number of large ponds, some of them covering an area of forty to sixty acres, which are the favorite resorts of many of the batrachians and not a few of the reptiles mentioned below. The city of Terre Haute is on the eastern bank of the river, on the edge of a prairie about two miles in width, beyond which a low range of hills forms the western border of a tableland which extends to the eastern limit of the county. At the point where the tableland meets the prairie the soil is a loose, black loam, containing a great deal of sand. Here, in a woodland pasture of about forty acres, rather thickly grown up with underbrush, and having near its center several shallow ponds, about the margins of which are numerous logs, have been collected no less than thirty-two of the forty-five species found in the county. Of course, many of these have been taken elsewhere, but the sandy soil and other conditions of this woods seems to suit

the salamanders and tree frogs, especially, as out of ten species of the former and four of the latter all but one have been seen here, and nine of the fourteen nowhere else in the county.

On one afternoon in October a class of fifteen zoölogy pupils took forty-six specimens of salamanders, representing four species, from this place, and on two other occasions the writer has found there six different species of the same animals within less than an hour's time. I have been thus specific in mentioning the above locality, because I believe that upon the character of the soil, rather than upon other conditions, such as latitude, temperature, etc., depends to a great extent the distribution of our batrachians and reptiles. For example, the genus *Spelerpes* is represented in Indiana by three species, *bilineatus*, *longicauda* and *ruber*. All of them are rather common throughout the central and southern portions of the State where limestone rocks and a drift or clay soil abound, whereas but a single specimen of one species, *bilineatus*, has been found in Vigo County, and it was taken, not from the loose sandy soil above mentioned, but from a worn out field, where the soil was wholly clay.

In the list which follows, the nomenclature and order of the Batrachians is that of Cope's recent and standard work, on "The Batrachia of North America;" while the revised edition of Jordan's "Manual of Vertebrates" has been followed in the naming of the reptiles. Where the species has been recorded from not more than two other stations in the State, those records are mentioned that the list may prove more valuable to future collectors.

BATRACHIA.

PROTEÏDA.

PROTEIDÆ.

I. NECTURUS MACULATUS, Raf.—Water Dog.—Mud Puppy.

Common in the Wabash River. Specimens two feet long and over are often taken in the Spring and Fall. Although some of the older fishermen have caught hundreds of them, they yet believe the bite of the animal to be very poisonous, and they either crush its head before attempting to remove the hook, or else cut the line and allow it to escape.

URODELA.

AMBLYSTOMIDÆ.

2. AMBLYSTOMA OPACUM, Gravenhorst—Marbled Salamander.

A single specimen, three and a half inches in length, was taken October 21, 1890, from beneath a log in sandy, upland woods. It was within six inches of a specimen of *Eutainia saurita*, and not more than a foot away were two spotted salamanders. Its previous Indiana records are New Harmony (Sampson) and Wheatland (Ridgeway).

3. AMBLYSTOMA PUNCTATUM, Linn.—Spotted Salamander.

Common in dry upland woods with a sandy soil. Numerous specimens from an inch and a half to six inches in length were taken November 2, 1890, the young being colored similarly to the adults.

4. AMBLYSTOMA TIGRINUM, Green—Tiger Salamander.

Three years ago this was the most common *Amblystoma* in the county, *A. punctatum* being seldom seen. Now the latter far outnumber the former, and but few *tigrinum* are to be found. They frequent both upland and bottom woods, and quite often find their way into cellars in the city. The color of this species depends greatly on the age, old specimens having the yellow spots large, and in some individuals covering more of the surface than the brown, whereas, on June 2, 1888, eleven young about three inches in length were taken, almost all of which were uniform brown.

5. AMBLYSTOMA JEFFERSONIANUM JEFFERSONIANUM, Green.
Jefferson's Salamander.

An uncommon species, but two having been taken. They were found in sandy woods, at some distance from water, October 21, 1890.

6. CHONDROTUS MICROSTOMUS, Cope—Small Mouthed Salamander.

Quite common, and in this vicinity more often found beneath logs near the margin of ponds and in low damp places, than in dry woods. A single specimen, seemingly as lively as

in Summer, was taken January 11, 1890, from beneath the fine drift deposited near the margin of the high ground by an excessive rise in the river. Another, with a large mass of eggs, from some of which the young were escaping, was brought in from a pond on February 16.

PLETHODONTIDÆ.

7. *HEMIDACTYLIUM SCUTATUM*, Tschudi—Scaly Salamander.

Five specimens of this handsome little animal have been taken. One was found near the margin of a pond, on May 4, the others on two different occasions in late Fall, in dry woods. One of the latter had the entire upper side of tail of the same shade of yellow as the upper jaw. Other State records are Franklin and Marion Counties.

8. *PLETHODON CINEREUS CINEREUS*, Green.

8. (a.) *PLETHODON CINEREUS ERYTHRONOTUS*, Green.—Red-Backed Salamander.

These are the most common salamanders found at a distance from water in upland woods with a clay soil. They are seldom found in a sandy soil, and never, so far as the writer is aware, in the low, damp bottoms. They are about equal in numbers, and often five or six half grown individuals of each variety are found beneath the same log.

9. *PLETHODON GLUTINOSUS*, Green.—Slimy Salamander.

Frequent in upland woods with both sandy and clay soils. Usually not far from water, but never in it. The bluish white markings vary greatly in numbers and size even in adult specimens. On some they are no larger than pin heads, and are distributed regularly over the entire upper surface and sides. On others they are five or six times as large, and are almost wholly limited to the sides. Recorded before only from Monroe county.

19. *SPELERPES BILINEATUS*. Green—Two-Lined Salamander.

Rare, but one specimen having been taken or seen. It was found in a worn out field, where the soil was wholly clay.

11. DIEMYCTYLUS VIRIDESCENS VIRIDESCENS, Raf.—Green Triton.—Newt.

The form *viridercens* of this handsome variety is the only aquatic salamander found in the county, and it seems to be scarce, but two or three specimens having been secured from cisterns and ponds. The form *miniatus*, Raf., is more frequently taken and is found beneath logs, usually in sandy upland woods, and always at a distance from water. There is also found a dark colored form, of which a half dozen individuals have been taken; one large one from the waters of a cistern; the other five, smaller, from beneath logs near the margin of ponds. They have the back and sides very rough, as in form *miniatus*, and are *wholly devoid of the vermilion spots*, which are found in both *viridescens* and *miniatus*. The ones found beneath the logs were taken on November 2. They average two and a half inches in length, and have the back and sides to below the middle almost wholly black. The one from the cistern was taken November 9, and is three and a half inches long. It is less dark than the preceding, the sides being heavily shaded with mottlings of dusky.

This, perhaps, is but a form of the above variety, the change in color being due to some special environment which it undergoes. It is not mentioned by Cope, nor by any one else, as far as I am aware. Prof. O. P. Hay informs me since the above was written that he has a single specimen, similar to the form mentioned, which was taken at Brookville, Ind.

TRACHYSTOMATA.

SIRENIDÆ.

12. SIREN LACERTINA, Linn.—Mud Eel.—Siren.

Three specimens of this rare batrachian have been taken in recent years, two of which are now in the collection of the State Normal School. They were captured in a pond in the river bottoms on March 22, 1890. The third had been taken the April preceding in a similar locality. Hay records it from New Harmony, and Cope, on the authority of Profs. Coulter and Jordan, from Lafayette and the White River, respectively.

SALIENTIA.

BUFONIDÆ.

13. *BUFO LENTIGINOSUS AMERICANUS*, LeConte.—American Toad.

Common and exceedingly variable in color, some specimens being wholly black above.

HYLIDÆ.

14. *ACRIS GRILLUS CREPITANS*. Baird.—Cricket Frog.—Peeper.

This is the most abundant tailless batrachian in the county. Hundreds can be seen along any small stream in Spring and Autumn. They appear less common in Summer, but are active in certain localities even in midwinter, lively specimens having been taken on December 23, January 9, and February 16.

15. *CHOROPHILUS TRISERIATUS*, Wied.—Swamp Tree Frog.

Rare, a single specimen having been taken from the edge of a pond on June 2. "Marion and Franklin Counties."

16. *HYLA PICKERINGII*, Storer.—Pickering's Tree Frog.

Four specimens of this interesting little frog were taken in 1890; two from the margin of a pond, in the woods mentioned in the introduction, on April 8, where they had evidently resorted for the purpose of depositing their eggs, and two on June 5 in the same woods, but a distance from water. The first two were kept in captivity for several weeks, and regularly at about 8 P. M. they began their shrill piping notes, keeping them up for almost an hour, after which they were silent till the next evening. Preceding each note the vocal sac of the throat expanded until it was two-thirds as large as the animal itself, when suddenly the air thus collected was forced out, producing the sound by its escape. The only previous Indiana record is Monroe County.

17. *HYLA VERSICOLOR*, LeConte.—Common Tree Frog.

Abundant; as many as five have been taken in November, within an area of a square foot, from beneath the bark of an oak log.

RANIDÆ.

18. *RANA VIRESCENS VIRESCENS*, Kalm.—Leopard Frog.

The most common of our larger frogs, especially about the river bottom ponds. It, also, is gregarious, a dozen or more being often found beneath a small log in late Autumn or early Spring.

19. *RANA PALUSTRIS*, LeConte.—Pickerel Frog.—Swamp Frog.

A rare species in this locality, but two having been seen. They were taken in May from the grassy margin of an upland pond. Previously recorded from Monroe and Franklin Counties.

20. *RANA CLAMATA*, Daudin.—Green Frog.—Spring Frog.

A common frog about all upland streams and springs, but seldom seen in the low lands. Never more than one or two are found in a place. During the open Winters of 1888-89 and 1889-90 several specimens of this, as well as of *virescens*, were seen on different occasions in December and January. On February 16, 1888, they, together with the "peepers," were in full chorus.

21. *RANA CATESBIANA*, Shaw.—Bull Frog.

Frequent; found from April to October in the larger lowland ponds and the deep still waters of streams, but is more often heard than seen. Its numbers are becoming less year by year, a fact, no doubt, due to the taste which man has developed for its tender thighs.

22. *RANA SYLVATICA*, LeConte.—Wood Frog.

A frequent species in dense, damp woods. Difficult to capture on account of its quickness and enormous leaps.

Of the twenty-seven batrachians mentioned by Prof. O. P. Hay, in his "Catalogue of the Amphibia and Reptilia of Indiana," published in 1887, the above twenty-two have been taken within a radius of five miles of the city of Terre Haute.

REPTILIA.

OPHIDIA.

COLUBRIDÆ.

1. *STORERIA OCCIPITOMACULATA*, Storer.—Red-Bellied Snake.

This handsome little snake is rare in Western Indiana, and for that matter throughout the State. A single specimen taken from beneath a log in upland woods represents what is known of the species in Vigo County.

2. *STORERIA DEKAYI*, Holbrook.—DeKay's Brown Snake.

Rather frequent, especially in Spring. I have never found it near the water, although W. H. Smith, in his Report on the Amphibians and Reptiles of Ohio, says that it is aquatic.

3. *TROPIDOCLONIUM KIRTLANDI*, Kennicott. — Kirtland's Snake.

This species is rare in Vigo County, where but two specimens have been taken, but in Putnam County, forty miles northeast, it is rather common. It must be nocturnal in its habits, as every one of the half dozen or more specimens which I have seen were found coiled up beneath logs or stones, and usually close to small streams.

4. *EUTAINIA SAURITA*, L.—Riband Snake.—Slender Garter Snake.

This graceful snake is quite common, and is usually found in the vicinity of water, but has never been seen by the writer to enter it. For three years it has been the first species seen in Spring—the dates being March 23, 18 and 22, respectively.

5. *EUTAINIA FAIREYI*, Bd.-Gr.—Fairie's Garter Snake.

Rare. Two specimens in the collection of the State Normal School and one in my own are all that I have seen. Vigo County is probably near the eastern limit of its range.

6. EUTAINIA SIRTALIS, L.—Common Garter Snake.
6. (a.) EUTAINIA SIRTALIS ORDINATA, L.—Grass Snake.
6. (b.) EUTAINIA SIRTALIS DORSALIS, Bd.-Gr.
6. (c.) EUTAINIA SIRTALIS PARIETALIS, Say.—The Red-Sided Garter Snake.

All four of the above varieties of this variable species are found in the county, *sirtalis* and *parietalis* being our most common snakes. *Ordinata* and *parietalis* are mostly found in upland fields; the other two about the lowland ponds. During the high waters, in the second week of January, 1890, several snakes were reported seen about the river, and on the afternoon of the 11th I set out to verify the report, and after a short search found two specimens, one *sirtalis*, the other *parietalis*, beneath some fine drift near the margin of the overflowed bottoms. Although it was midwinter, they were not sluggish in their actions, both making a lively attempt to escape when disturbed.

7. REGINA LEBERIS, L.—Queen Snake.—Leather Snake.

This species, recorded heretofore only from Montgomery and Franklin Counties, is common in all the larger streams in this portion of the State, having been taken by the writer in Putnam, Owen and Vigo Counties. Unlike the next species, it is seldom, if ever, found about deep pools or ponds, but frequents shallow, running water, gliding gracefully among the stems of the water willow (*Dianthera Americana*), and other aquatic plants, and when pursued takes refuge beneath one of the many stones usually found in such a place.

8. TROPIDONOTUS SIPEDON, L.—Water Snake.—Water Moccasin.

An abundant species, especially about the river bottom ponds, where it grows to be of enormous size. It is most commonly known as the water moccasin, and is usually given a wide berth—nine persons out of ten believing that its bite will cause certain death. It feeds principally on frogs, no less than seven large specimens of *Rana virescens* having been

found in the stomach of one which was dissected on account of its aldermanic appearance.

9. COLUBER OBSOLETUS, Say.—Pilot Snake.

A large and rather common snake, found in dry, open woods, oftentimes in trees and bushes. A specimen five feet, seven inches long was kept for some time in captivity in a vacant room. When approached it would vibrate its tail very rapidly from side to side, producing a distinct rattling sound, and on entering the room at night with a lamp it would hiss with a loud gurgling noise. A large specimen of the great horned owl, *Bubo Virginianus* kept in the same room was finally attacked by the snake, and when discovered the latter had two coils tightly wrapped about the owl, and had crushed it so badly that it soon died.

10. CYCLOPHIS ÆSTIVUS, L.—Summer Green Snake.

At least a dozen specimens of this beautiful and usually rare snake have been taken. It is found on rocky hillsides, most commonly in the vicinity of running water. I have also seen two specimens in blackberry bushes, about four feet from the ground. A specimen kept in captivity in a glass case often rested upon the lower half of its body and raising the other half almost vertically, it would remain rigid and motionless for ten or fifteen minutes at a time.

11. BASCANION CONSTRICTOR, L.—Black Snake.—Blue Racer.

Formerly very common throughout the State, but becoming much less so each year, as nine out of every ten seen are usually killed out of pure wantonness by persons who know nothing of their vermin-eating habits. Another cause of their lessening numbers is undoubtedly the rapid disappearance of the old Virginia rail fences, beneath the bottom rail of which they were sure of a safe retreat from all attacks. A few are seen every year in this vicinity, and if met with in late Fall, when they are seeking a hibernaculum, are very vicious, hissing and striking at a person even when several yards away. The young are very different in color from the old, being olive brown, with numerous large, darker colored spots along the sides.

12. *DIADOPHIS PUNCTATUS*, L.—Ring-necked Snake.

Rare, but two specimens having been seen. Both were found beneath the same fence rail on a hillside having a southern exposure.

12. (a.) *DIADOPHIS PUNCTATUS AMABILIS*, Baird & Girard.

A single specimen of this western variety is in the writer's collection, and was taken May 12, 1889, from beneath the bark of a fallen tree. It has no other Indiana record, but is said to be occasionally found in Ohio.

13. *OPHIBOLUS GETULUS SAYI*, Holbrook.—King Snake

A small specimen of this handsome snake was taken on the 22d of October, 1888, and so far as known is the only one which has been seen in the State. It has, however, been taken at Mt. Carmel, Illinois, just across the Wabash River from Indiana.

14. *OPHIBOLUS DOLIATUS*, L.—Red Snake.—Corn Snake.

The typical *doliatus*, which has been taken before only in Brown and Posey Counties, is represented from Vigo by two specimens, one in the collection of the Normal School, and the other in that of the writer. Nothing is known concerning its habits.

14. (a.) *OPHIBOLUS DOLIATUS TRIANGULUS*, Boie.—House Snake.—Milk Snake.

This variety of the above species is one of our most common reptiles, and as its name indicates, is often found about dwellings and outbuildings. The arrow-shaped occipital spot is as often absent as present, and the size and shape of the blotches vary in every conceivable way. A specimen seen by the writer had an unbroken grayish white dorsal stripe about eight inches in length.

15. *HETERODON PLATYRHINUS*, Latreille.—Spreading Adder.
Blowing Viper.

This species is also very common, especially in early Spring (March 22, 1890), when they are found in small companies on

sandy hillsides and prairies. The var. *niger* is almost as frequent as the typical species, and, in the writer's opinion, is but a mere form. On April 13, 1889, a specimen of *niger* was found in copulation with one of the typical *platyrhinus*, while but a foot or two away was another *platyrhinus*. When separated they opened wide their mouths, turned on their backs, and coiled and twisted about in a very rapid and curious manner for about five minutes, when they became quiet and apparently lifeless. During all these contortions they had remained on their backs, and when they became quiet and were turned over they would immediately turn on their backs again, but otherwise gave no signs of life, even at the end of an hour's time. By every one except the student of herpetology this is considered one of the most venomous of snakes, but by experience I know that its bite is no more painful than that of a mouse.

CROTALIDÆ.

No specimens of this family have been seen by the writer within the county, and hence none are included in the catalogue. If, however, the snake stories of the older inhabitants can be relied upon, two species of rattlesnakes and the copperhead were once frequently to be found in suitable localities throughout the county.

LACERTILIA.

SCINCIDÆ.

16. *EUMECES FASCIATUS*, L.—Blue-tailed Lizard.

This is the only species of lizard found within the county, and it is not often seen. It frequents dry upland woods, usually hiding beneath logs and stones, but has been observed on several occasions high up on the trunks of trees.

TESTUDINATA.

TRIONYCHIDÆ.

17. *AMYDA MUTICA*, Le Sueur.—Leather Turtle.

A single specimen from the Wabash River is in the writer's collection. It is, no doubt, frequently taken by the fishermen who confound it with the next species, applying the

name "soft-shelled turtle" to both. From the State it has been recorded from Delphi and Madison.

18. *ASPIDONECTES SPINIFER*, Le Sueur. — Common Soft-Shelled Turtle.

An abundant species in all streams, and the one most utilized as food. I have seen it moving freely about in the water as late as December 11 and as early as March 19.

CHELYDRIDÆ.

19. *CHELYDRA SERPENTINA*, L. — Common Snapping Turtle.

This common turtle grows to a very large size in the river bottom ponds, from which it is often taken and used as food, especially in making the turtle soup sold in the saloons. It is more frequently found in stagnant water than any other species. During the severe drouth of the past Summer, when the beds of most of the streams were dry or nearly so, five specimens, none of which weighed less than eight pounds, were taken from a mudhole in a small creek. The size of the hole was about 12 x 3 x 2 feet. Each of the turtles had at least fifty fresh water leeches attached to the sides of the neck or to the carapace.

EMYDIDÆ.

20. *MALACLEMYS GEOGRAPHICUS*, Le Sueur. — Map Turtle.

Rather common in the river and larger streams, but seldom seen except when captured in a seine.

21. *MALACLEMYS LESUEURI*, Gray. — Le Sueur's Map Turtle.

A single specimen was taken from the roadside, over a half mile from water, in May, 1888. It is said by Hay to be found throughout the State, but is evidently scarce.

22. *CHRYSEMYS MARGINATA*, Agassiz. — Painted Turtle.

An abundant species about ponds and the deeper pools of streams. It is one of the first turtles seen in Spring, the dates for the last three years being March 7, 11 and 21, respectively. *C. picta* has never been seen by the writer in western Indiana.

23. CISTUDO CAROLINA, L.—Common Box Turtle — Land Terrapin.

This is the only truly terrestrial turtle found in the county. It is common in sandy upland woods, but has never yet been seen in the bottoms. The young evidently remain hidden for a number of years, for out of perhaps fifty individuals seen by the writer the smallest was four and a half inches in length. Specimens of the box turtle were taken in 1890 as early as April 8 and as late as November 22, and on two different occasions it has been observed to feed upon a species of fungus growing upon an oak log.

There are doubtless other reptiles, especially turtles, to be found in the county, but the above are all that have been seen by the writer.

Since writing the foregoing the following captures have been made in the hillside woods noted in the introduction :

AMBLYSTOMA OPACUM—Gravenhorst.

Two more specimens of this salamander were taken from beneath logs on March 22d and 28th respectively. When disturbed they seem to be more active than the other species of *Amblystoma* found with us.

CARPHOPHIOPS HELENÆ, (Kennicott) Helen's Snake.

A single specimen of this graceful little reptile was found coiled up in some dead leaves on April 14th. This is, as far as known, the most northern station from which it has been recorded.

"A CINCINNATI BOY IN THE TROPICS."

BY CHARLES DURY.

[Read April 7th, 1891.]

TRAVELS OF WM. DOHERTY.

In the Spring of 1873 there came to my work shop in Avondale, a small, pallid, feeble looking boy, whose head seemed to be too large for his body. His well chosen language and sage remarks indicated an "old head on young shoulders." I never saw any one so completely infatuated with natural history. He wished to accompany me on expeditions after birds and insects. On the first day's trip he became sick, and I was obliged to leave him exhausted on a log. But his determination was strong and he tried it again, the long tramps developed and strengthened him. In March, 1878, William Doherty being then twenty years old, sought and obtained an appointment as an assistant of the "Smithsonian Institution" to the Paris Exposition, in charge of the United States exhibit. After filling, in a creditable manner, his duties, he received his discharge, and started off to see Europe on foot, leaving Paris late in July, and going to Holland, Germany, and Italy, diligently studying French and German, arriving at Venice in October. From there he went to Turkey, arriving at Constantinople November 16th. From there he pushed on to Greece, traveling all through that country on foot, living cheaply in monasteries. The people were most delightful, and treated him with the greatest hospitality. The language spoken was the ancient Greek, in its greatest purity, even by the common people. He located near Athens, and devoted a year to the study of language. During 1880 he tramped over the Holy Land, living with the missionaries, one of whom, Rev. Mr. Eaton, said he had a phenomenal talent for language. During his tramp over Egypt he corresponded for the *New York Tribune*. He then went to Erzerum, arriving November 22, 1880. Here he bought an Arab horse he

called "Alp," for a grand trip through Persia; went to Mt. Ararat, and got into Russian territory, but was promptly escorted out by the authorities. He rode around the Caspian Sea, visiting the places famous in the "Arabian Nights," mastering the Persian language as he traveled, studying by moonlight and living with the people. At Persopolis he made a careful study of the famous ruins. Had a severe attack of "Caspian fever," but recovered. Came to Rescht May 6, 1881, from there around to Asterabad, and thence via Teheran, traveling with a caravan down to the Persian gulf to Shiraz, where he sold his Arab steed. On this horse he had traveled hundreds of miles, sleeping at night between his fore and hind legs to keep warm, eating and living with the noble brute. The parting from this animal was a very sad one, and made him sick. He says, near Shiraz the Asiatic lion begins to show itself, but is not nearly so dangerous as the tiger of India. March, 1882, finds him yet on the Persian Gulf at Muscat, in Arabia, deeply engaged in the study of fishes, under the direction of Dr. Jayako, a Mahretta and man of science, who has Günther's great work on fishes. Here he dissected and preserved fishes. He reveled in the gorgeous tropical fish and coral groves. He says, "I have been dissecting to-day black looking things that look like bits of broken sticks a foot long; these are 'Tripang' or 'Sea Cucumbers.' I am working on these in view of my future profession" (natural history). He now having gotten well out of reach of parental control, for the first time mentions the object so dear to his heart, and to which he proposes to devote his life, the study of nature. His parents had forbidden this, wishing him to study law. From the Persian Gulf he went through Beloochistan and Afghanistan and thence to the "Punjab" and the "Vale of Cashmere," all the time collecting butterflies, which he sent to Europe to be sold. He worked along the southern slope of the Himalayas, traveling with the sheepherders, who transport merchandise on the backs of their sheep into remote places, where they take them, in search of new pastures. He once received three letters from his mother, that were being transported (with mail) on the back of a sheep, in search of him. From the Punjab he went to Lucknow, to study the details of the Sepoy insurrection. In a letter from Notinga, State of Jaipur, December 20, 1882, he

says: "These simple children of nature, the 'Kandhs,' a few years ago used to buy slaves from the low country and sacrifice them on the altar, for the benefit of the next year's crop; an old chief informed me that since this practice had been stopped, they had never had as good crops. I had established myself at a camp by the roadside, eleven miles from Sunki, and had there a rather serious experience. While working successfully this zoologically unknown country, the cholera broke out with great force, and every body deserted that could. I managed to keep my old cook, by not paying her all of her wages (the great secret of keeping servants in this country); even the dresser or surgeon ran away, leaving the sick to their fate. There were more than thirty people left in the camp, many of them in a half dying state, though some had passed the crisis of the disease; they were all huddled into two or three huts to escape the tigers, which they seemed to fear more than fresh contagion. The only well people in the camp were myself and Mushaludi, my cook, and her daughter. (Mushaludi was a great thief; the fowls she cooked for me always lacked their full complement of legs and wings). I took a sort of grim pleasure in this affair so far, and made a trip to the top of the highest mountain in this country and got some new insects near the summit. On my way home from this trip I passed a burned village, the poor people mourning over the ashes, and grubbing up their scant stock of "Paddy" from the ruins. Many of them died of hunger and cold. I made a trip to a neighboring village, to try and get help for the sick, but I found the people not much concerned with the affairs of this world. They were dying like flies! On January 14th I was taken sick; the same evening I met a leopard in the camp, but he ran away. I went into my hut that night, I heard the hyenas shrieking all night, and some one sneaked in and stole my rice. I dosed myself with chlorodyne; that stopped the disease, but left me almost insensible. When I recovered, and, though very weak, I went out; no one was alive in the camp. I saw one man's body half eaten up by wild beasts, and a girl that I thought was getting better was dead, and teeth marks showed the cause of her death. About thirty people are supposed to have died in and around this camp." From this pestilential country Doherty went to the Island of Ceylon, August 11th, working

all the time on the natural history of the country, and selling his collections to pay his expenses. From Ceylon he went to Calcutta. He had letters to the Indian Museum and also to British officers, who invited him to go on elephants to visit the Queen of Burma; each elephant had a retinue of seventy men to cut paths and drive away tigers. An elephant can go almost any where, but a path must be cut, as the bamboos and other vegetation would sweep the rider off, if not cut out of the way. They were royally received by her Majesty, the Queen, who chewed tobacco and expectorated into little dishes, and passed it around for her guests to taste, as a great mark of esteem! Doherty says, "I made up my mind I would die before tasting it." On his return to Calcutta, he obtained permission from the government to visit the Andaman Islands, and was kindly received at the penal settlements on Christmas, 1884. In attempting to go over to another one of these islands in a small boat, he was fired on by the natives, and his Chinese boatman killed with a poisoned arrow, but he landed, and with a liberal use of presents, made friends of the natives, and secured fine collections of the insect fauna. He went to the Nicobar Islands, and afterwards again to the Andamans. In 1885 he collected butterflies at Madras and Bombay. In 1886 he visited Benares to write up the old wares, china and brasses, and the old idols in the Mogul temples, for the *London Times*. Writing from Sarti, he says, "I came here on an elephant with a guard of Sepoys, and am catching lots of butterflies. I never saw bamboo used for such a variety of purposes as here. A Coolie is now boiling my tea in a joint of it. These people use it for most every thing." While in Benares he engaged some Lepchas, who are the most skillful butterfly catchers in the world. He says, "the two pests of this country are tigers and the deadly cobra, and I am always obliged to keep a bold face while in the jungle, so as to set a good example to my native collectors. There is not so much danger from tigers, when one stands erect with a butterfly net in his hand, but when we are stooping, raking in the leaves, we are in great danger." He came down the Malay peninsula (coming overland from Calcutta to Penang), where he was laid up, covered with sores and boils on the soles of his feet, so he could not walk. When he recovered, he went to the island of Java, and from there to Celebes, and

others of the Malayan Islands, catching butterflies all the time and selling enough of these beautiful creatures to pay all expenses. These eastern islands have the famous *Ornithoptera* or bird-winged butterflies, that are not found in any other part of the world. These sell for big prices. December 21, 1887, he went to the great island of Borneo. This was his first trip there, and it was a most unfortunate one; his boxes of implements and supplies went astray, and he never heard of them afterwards. This included his mss. notes for five years, microscope, books, etc., and in addition to this, "my remittances for butterflies sold failed to reach me, and to add to my misery I missed the season for collecting completely. "This wretched year has taken all the youth out of me." He adds: "Mr. Hoze told me not to venture to the interior Dayak villages; that they were cannibals, head hunters, snake eaters and devil worshipers! and that they would abandon their villages if I came there, and they would soon have my head smoking over their fire, that they spoke no Malay, but only a monkey gibberish. In spite of this dire prophecy, I went any way. I found the people kind hearted and honest, though their fear of me was something amusing, but when it wore off we were the best of friends. They do not now hunt heads, and the old ones they had were taken a long time ago, and in fair open battle, whereas in Celebes and even here, up the Barito, it is considered "*comme il faut*" to get one's head on the sly, and women going to draw water and old men too decrepit to fight, are the favorite victims. The language of these Dyaks I can readily understand. I can even understand the little children talking to each other, the severest test of the knowledge of a language. The honesty of these Dyaks is surprising. I go away and leave my bamboo house open and my things scattered over the floor and shelves; and when I return find everything has been examined and inspected by these people, who have visited the house during my absence, but not so much as a pin is missing. Here I am with almost nothing to eat, a little rice porridge and occasionally a scrap of venison dried to a chip over a slow fire. Oh! when I get back to Pengaron won't I get a side of bacon and feast! I have been so weak from this bad diet I can hardly run fast enough to catch butterflies. However, I console myself with the reflection that 'good things

are better than bad things are bad.' I always get enthusiastic when I write or think about beefsteak or pork. I will send this letter down the river by one of the Dyak diamond searchers, who has just found a ten carat-stone. He is going down to Martapura to sell it, and if he makes a good sale, he will not do any more work for a year or so. There are no dangerous animals here in Borneo, quite a relief from certain districts in Java, so terribly infested by tigers." These Dyaks do not seem to resemble those at Sarawak, as described in a book called "Life in the Jungle." "This book, by the way, is a remarkable instance of how little effect education has on literary success. The writer is a showman's assistant. The same year Forbes' book, the work of a polished English gentleman of high scientific attainment, came out, yet Forbes' book is a flat failure, while the other is a model of life-like and interesting narrative. Here in Borneo there are no flowers, and but little life during this wet season to be seen; every thing is obliterated and crushed out of existence by this tremendous mass of green foliage. I measured a leaf of a calladium and it was ten feet long by seven and one-half feet wide, exclusive of the stem." After returning to India and working up the Chittagong and Assam butterflies, Doherty is again in the Malayan Archipelago, and expects to go into the great "terra incognita" for naturalists, the interior of New Guinea, to collect her unknown treasures. He has found hundreds of species of insects entirely new to science, many of which he has described and illustrated with colored plates in Trans-Asiatic Society. The most extraordinary thing about this remarkable trip is, that he has more than paid all his expenses by the sale of his insects. During the present year his sales will amount to \$5,000. He numbers among his purchasers some of the most eminent men of science in the world, such as Lord Walsingham, who buys his minute moths; Mr. Bates, who buys his Longicorn beetles; Dr. Standinger, of Germany, who buys large moths and butterflies; Neumoegen, who buys butterflies; T. H. Aldrich, of Cincinnati, who buys his shells, and other specialists, who take the different families. He says, "my beggar-like and dilapidated garb was my safeguard against robbers and thieves, and my running after butterflies was calculated to impress them that I was a harmless lunatic, and so I got through, where a more pretentious

personage might have failed." He collects the butterflies, and after killing them, folds them up in triangular papers, with their fragile and delicate wings folded over the back. When softened and spread they come out in all their exquisite beauty. Naturalists are noted for their enthusiasm, but such perseverance and enthusiastic devotion to the study of nature and her works, in the face of difficulties that would appall most people, is seldom heard of. Doherty has pushed on, under a tropical sun, sometimes in a pestilential climate, stricken down with the deadly fevers and cholera, that are always lurking in those places, some times blinded and covered with sores from bad food and exposure, often with insufficient supplies and almost at the point of starvation, living with savage natives, menaced with the fearful animal pests of these countries, traveling long distances on foot through thorny jungles, yet never deviating from his object, nor tiring in his search, for nearly fourteen of the best years of his life. His is a case unequaled in the history of the many brave and dauntless spirits, who, in the face of almost insurmountable difficulties and hardships, have wrested from nature some of her choicest treasures.

NOTES ON BIRDS.

BY CHARLES DURY AND RALPH KELLOGG.

This season has been remarkable for the scarcity of many species of birds that are usually common in this locality. The Warblers have been very scarce, and but a single Scarlet Tanager has been seen by either of us. An exception to this scarcity was the occurrence of the Golden-winged Warbler, *H. chrysoptera*, always a rare bird in this locality. Two were taken by Ralph Kellogg May 5th, in an old orchard in Avondale, and seven others were seen in company with Redstarts.

"BEWICK'S WREN," *Thryothorus bewickii* (Aud.)

April 14, 1891, I shot a male of this wren. It was singing its loud and unwren-like song from the branches of a cherry tree. April 10, 1891, one was taken by Roland Hazen, and May 31 a male was observed building a nest in a box near Mr. Kellogg's house, Avondale. Its mate was never seen. It remained for about ten days and finally disappeared. These are the only ones of this species I have any record of from this locality. In Notes on Birds, by Dury and Freeman, this JOURNAL, there is mention made of two, March 27, 1879.

ORANGE CROWNED WARBLER, *Helminthophila celata* (Say).

In the July, 1887, number of this JOURNAL, I recorded the occurrence of this species April 28, 1878. On September 20, R. Kellogg killed, at one shot, one of this and two Tennessee Warblers as they were feeding in company.

"SAVANNAH SPARROW," *Ammodramus savanna* (Wils).

"SHARP-TAILED FINCH," *Ammodramus caudacutus* (Gm).

"SWAMP SPARROW," *Melospiza georgiana* (Lath).

Specimens of these sparrows taken at Ross Lake, April and May, 1890 and 1891.

"KING BIRD," *Tyrannus carolinensis*.

A male, shot May April 27; had a living beetle in its throat, and from its gizzard another was taken of same species dead, both belonging to the genus *Pomphopœa*, the first of these beetles ever observed here.

"LEAST BITTERN," *Botaurus exilis* (Gm.)

On May 20, 1891, seven of this very pretty little Bittern were taken, five of them males and two females. These birds feed largely on the larvæ of "dragon flies" (*Libellulidæ*) but from the stomach of one a "sunfish," as large as a silver dollar, was taken.

"LITTLE BLACK RAIL," *Porzana jamaicensis* (Gm.)

On May 16, 1891, Mr. Kellogg took another one of these interesting and heretofore rare little rails (in the same locality as the first one). He has very kindly presented it to the Cuvier Club collection. On the 17th of May another was taken at the same place. On May 21 another was taken by David Belding. May 23, Mr. Kellogg secured another, and on the 30th three more—one a female, which was caught by the dog who squeezed an egg, nearly fully developed, from the oviduct. This makes six males and one female, all from the same locality. When the bird is flushed it flies a short distance and alights, it is then almost impossible to flush it a second time.

"CLAPPER RAIL," *Rallus crepitans* (Gm.)

May 1, 1891, while crossing the Suspension Bridge over the Ohio River, Henry Cain observed one of these birds running ahead of him. He captured the bird alive, in good condition, with his hat.

"SNOW GOOSE," *Chen hyperborea nivalis* (Forst.)

A specimen of this species was shot at Ross Lake, April 11, 1891, by Roland Hazen.

MANUAL OF THE PALEONTOLOGY OF THE CINCINNATI GROUP.

BY JOSEPH F. JAMES, M. Sc., F. G. S. A.
(U. S. Geological Survey.)

PART I.

The object in view in preparing the series of papers, of which this is the first, is to present to the students of paleontology of the Ohio valley, in a convenient form, descriptions of the fossils known to occur in the rocks of Lower Silurian age in Southwestern Ohio and the vicinity. The generic and specific descriptions are scattered through many different volumes, and the writer believes the collation and arrangement of them in a compact form will be an assistance and an incentive to the study of paleontology. The present, the first installment, treats of *Plantæ* and *Protozoa*.

PLANTÆ.

ALGÆ.

Under the head of *Fucoids*, which have generally been considered as *Algæ*, a number of species have been described by authors. It is extremely improbable that *Algæ* have left any remains in this formation. An attentive study of the forms described as *Fucoids* shows the larger number to be referable to annelid borings or burrows; or else to be inorganic in origin. Some may be referred to impressions left by certain forms belonging to other classes, and possibly to graptolites. None are, we believe, to be assigned definitely to the class *Algæ*. The forms of inorganic origin will be treated of here. Those referred to other classes will be discussed under each, respectively. (See under CÆLENTERATA, HYDROZOA, ASTERIDEA, ANNELIDA and TRILITES.)

Consult in respect to the supposed *Algæ* "Fucoids of the Cincinnati group." This JOURNAL, vol. 7, pp. 124-132, 151-

166, October, 1884, and January, 1885; Dawson's Geological History of Plants; Quart. Jour. Geol. Soc., London, vol. 46, 1890, pp. 595-617; Nicholson & Lydekker's Manual of Paleontology, vol. 2, 1889, pp. 1480-1489.

SPECIES REGARDED AS OF INORGANIC ORIGIN.

Aristophycus ramosum, Miller and Dyer. Contr. to Paleont. No. 2, 1878, p. 4.

Var. *germanum*, M. & D., Ibid. 1878, p. 4.

Both the species and the variety were described as branching stems, the ramifications being sent off without any definite order, and the smaller fibers inosculating like the veins of a leaf. They are both due to the running of water over a muddy bank. Mr. S. A. Miller, in the supplement to his catalogue of Palæozoic Fossils, 1883, acknowledged these forms to be inorganic in origin.

Chloephyucus plumosum, Miller and Dyer. Contr. to Paleont. No. 2, 1878, p. 3.

Buthotrephis filiciformis, U. P. James. The Paleontologist, 1878, p. 9.

Described as *Algæ* with a main, central stem, and with minor branches jutting out at an angle on either side. Produced by the trickling of water over a bank of sand or mud. Since recognized by the authors as of inorganic origin.

Palæophycus flexuosus, U. P. James. The Paleontologist. 1879, p. 18.

Described as if made of stems flattened by pressure and laid down close to or overlapping and parallel with each other. Really produced by the washing of water along the shore, thus arranging the mud in regular layers. Acknowledged by the author to be inorganic in origin.

Trichophycus sulcatum, Miller and Dyer. Contr. to Paleont. No. 2, 1878, p. 4.

T. venosum, Miller. Jour. Cin. Soc. Nat. Hist., vol. 2, 1879, p. 112.

Described as cylindrical or semi-cylindrical stems with fine hair-like markings upon the rounded, upper surface; the lines diagonal or longitudinal, and more or less irregular. Probably the cast of a depression made in the mud by running water.

MARKINGS OF ORGANISMS.

Dystactophycus mammillanum, Miller & Dyer. (See under CœLEENTERATA.)

Heliophycus stelliforme, Miller & Dyer. (See under ASTERIDEA.

For the following, see under ANNELIDA.

ARTHRARIA ANTIQUATA, Billings. Syn. *A. biclavata*, Miller.

Blastophycus diadematus, Miller & Dyer, as PLANOLITES DIADEMATUM, M. & D. (sp.). Syn. *Trichophycus lanosus*, M. & D., *Saccophycus intortus*, U. P. James.

Buthotrephis ramulosa, Miller as PLANOLITES RAMULOSUS Miller (sp.).

B. succulens Hall as PLANOLITES SUCCULENS Hall (sp.).

Buthotrephis gracilis, var. *crassa*, Hall, as PLANOLITES CRASSA, Hall (sp.).

Licrophycus flabellum, Miller & Dyer as PLANOLITES (?) FLABELLUM, M. & D. (sp.).

Palæophycus radiata, Orton as PLANOLITES RADIATUS, Orton (sp.). Syn. *Dactylophycus quadripartitum*, M. & D., and *D. tridigitatum*, M. & D.

P. rugosum, Hall as PLANOLITES RUGOSA, Hall (sp.).

P. tubulare, Hall as PLANOLITES TUBULARIS, Hall (sp.). Syn. *P. simplex*, Hall.

P. virgatum, Hall, as PLANOLITES VIRGATUM, Hall (sp.).

Rusophycus asperum, Miller, as PLANOLITES ASPERUM, Miller (sp.).

R. subangulatum, Hall, as PLANOLITES SUBANGULATUM, Hall (sp.). Syn. *R. clavatum*, Hall.

SCOLITHUS DELICATULUS, U. P. James.

For the following see under TRAILS.

CRUZIANA (*Rusophycus*) BILOBATA, Hall (sp.).

C. CARLEYI, J. F. James.

C. (*Rusophycus*) PUDICA, Hall (sp.).

Scolithus dispar, U. P. James as EOPHYTON LINNÆANUM, Torell.

Lockeia siliquaria, James, see as DAWSONIA SILIQUARIA, U. P. James (sp.) under HYDROZOA.

Buthotrephis gracilis, Hall, see as DENDROGRAPTUS GRACILLIMUM, Lesqx (sp.). Syn. *Psilophyton*.

RHIZOCARPEÆ.

An order of Heterophyta (Cryptogamia) represented in existing floras by about four genera and fifty species. Mostly aquatic, producing two kinds of spores. Leaves either simple or quadrifid.

SPHENOPHYLLUM, Brongniart. Hist. de Veg. Foss, 1828, p. 68. Lesquereux, Am. Phil. Soc., Proc., vol. 17, 1877, p. 167. Lesquereux, 2d Geol. Sur. Penn. P, Coal Flora, text, vol. 1, 1880, p. 51.

Stem articulate; leaves verticillate, cuneiform, crenulate, dentate or lobed at the apex, which is truncated or rounded; midvein wanting; nerves straight, diverging fan-like, simple at the base, dichotomously forking once or twice.

S. PRIMÆVUM, Lesqx. Am. Phil. Soc. Proc., vol. 17, 1877, p. 167.

Stems or branches slender; articulations close, equidistant; leaves in whorls, each of four or five leaflets, connected toward the base and joined by slightly obtuse sinuses; leaflets either truncate or crenulate at the apex, or sometimes deeply split or lobed; nerves simple at the base, sparingly dichotomous, forking once or simple. The only species of the genus so far known from this group.

Localities.—Covington, Kentucky; Lime-kiln Run, near Cincinnati, Ohio.

LYCOPODIACEÆ.

An order of Heterophyta which, in the existing flora, is small and of little consequence, though of large size in Carboniferous times. It comprises at present only four genera, and from sixty to seventy species. The Club-mosses are the best known living representatives. These are small, low-growing plants, with scale-like leaves and minute spores, produced either in the axils of the leaves or in cone-like bodies

at the ends of the branches. The single genus and species referred to the order here, is problematical. Dr. J. S. Newberry considers it to be doubtfully organic.*

PROTOSTIGMA Lesquereux, *Am. Phil. Soc., Proc.*, vol. 17, 1877, p. 169.

Cylindrical stems with rhomboidal scars. Only a single species known from this horizon.

P. SIGILLARIOIDES Lesqx. *Ibid*, p. 169.

Branches or stems cylindrical, scarcely flattened by compression; surface marked by rhomboidal cicatrices, enlarged on the sides, contiguous and in spiral order, with indistinct impressions of oval, vascular scars in the center.

(Consult on this species and on land plants in the Silurian in general, Dr. J. S. Newberry, as noted above.)

PROTOZOA.

Animals generally of minute size, composed of a nearly structureless jelly-like substance, (sarcodæ), showing no composition out of definite parts or segments, having no body-cavity, presenting no traces of a nervous system, and having either no differentiated alimentary apparatus, or but a very rudimentary one.†

Though abundant and of varied form in a living state, species of this group are rare in the older rocks, becoming more numerous, however, as modern times are reached. Though mostly microscopic, some form large communities, and are then readily perceived as a mass, though the individuals remain minute. Several orders are known in both a fossil and a recent state. Only two of them, FORAMINIFERA and SPONGIDA, are known from the Cincinnati group, if we except an anomalous order, STROMATOPOROIDEA, the position of which is still a matter of discussion.

Order FORAMINIFERA.

Structureless, gelatinous, generally minute animals, encased in a calcareous shell, and frequently of considerable size in a fossil state. The shell divided into compartments, the walls

* *Am. Jour. Sci.*, 3d ser., vol. 8, 1874, pp. 110-113.

† *Nicholson's Zoology*, p. 44

of which are pierced with holes, "foramina." The gelatinous body mass is protruded in the form of filaments from the numerous orifices.

At the present time these organisms are wonderfully abundant. D'Orbigny estimated that an ounce of sand from the Antilles contained 3,800,000 individuals. In past geological time they were equally numerous, in some places forming extensive series of rocks. In the Paris basin 58,000 have been counted in a cubic inch, or 3,000,000,000 in a cubic yard.

At present but one genus is referred to the order, described below. It is placed here upon the authority of Nicholson and Lydekker's *Manual of Palæontology*, vol. 1, 1889, p. 128.

GIRVANELLIA, Nich. & Ethr., Jr., 1878.

Rounded or oval bodies, composed of "microscopic tubuli, with arenaceous or calcareous (?) walls, flexuous or contorted, circular in section, forming loosely compacted masses. The tubes apparently single cylinders, without perforations in their sides, and destitute of internal partitions or other structures of a similar kind." (*Fossils of the Girvan District*, 1878, p. 23.)

Remarks.—As synonyms of this genus, as described above, should probably be placed *Strephochetus*, Seely, 1885, and *Streptospongia*, Ulrich, 1889. The following is Seely's description of *Strephochetus*: "A free calcareous sponge, showing in structure concentric layers, composed of minute twining canals." (*Am. Jour. Science*, 3d ser., vol. 30, p. 357.)

This name was proposed for certain spongoid bodies found in the Chazy rocks of Vermont. Its main character, as given in the meager description, is in the twining canals. In a later paper (*Am. Jour. Science*, 3d ser., vol. 32, 1886, p. 34), Professor Seely says: "The appearance of the members of the genus may be represented by the smaller fruits, currants, gooseberries and cherries, distributed through a paste of oolitic, fragmental or sub-crystalline material. These, in most cases, have been left in a crushed or torn condition. In weathered specimens they show a concentric structure, more or less regular, which is helpful in distinguishing the genus." This description corresponds exactly with the figures of *Girvanellia*.

Mr. Ulrich's genus, *Streptospongia*, is also founded upon a form with twisted canals. The description says that in trans-

verse section, "the sponge appears composed of labyrinthically intertwining vertical laminæ * * * separated by tortuous and almost linear interspaces, with here and there an irregular angular open space. * * * The vertical fracture shows that this remarkable intertwining is largely produced by connecting processes on the sides of the laminæ." (American Geologist, vol. 3, 1889, p. 244.)

1. G. RICHMONDENSIS, Miller, (sp.) 1882.

Free, globular or sub-spherical, varying in size from two-eighths to seven-eighths of an inch in diameter; consisting of numerous irregularly concentric laminæ, with the inter-lamellar spaces filled in most cases with small twining canals or minute vertical tubes; diameter of canals $\frac{1}{2000}$ of an inch; the vertical tubes have an average diameter of $\frac{1}{300}$ of an inch. When weathered the fossil has the appearance of a *Stromatopora*. (Emended description, Seely, Ibid 1886, p. 32). *Stromatocarium richmondense*, Miller, Jour. Cin. Soc. Nat. Hist., vol. 5, 1882, p. 41; *Strephochetus richmondensis*, Seely, op. cit., 1886.

Localities.—Richmond and Madison, Indiana; Turner's Station, Kentucky.

Remarks.—The emended description by Professor Seely is much better than the original. In the remarks upon it Professor Seely says: "Not unfrequently it occurs as an incrusting body, having for its core a bit of coral, or a fragment of the shell of a brachiopod. * * * The tubes present great uniformity of direction, though not of size. They run nearly parallel with each other for a little distance, and then are cut short by a laminar covering, which may be the basis for a similar set of slightly radiating tubes." (op. cit., p. 33.)

2. G. LABYRINTHICA, Ulrich (sp.), 1889.

Massive, siliceous, about 50 mm. long by 25 mm. wide by 30 mm. high. In vertical section appear labyrinthically intertwining vertical laminæ, about 0.3 mm. thick, separated by tortuous and almost linear interspaces, with an occasional angular open space, 1 mm. in length. (American Geologist, vol 3, 1889, p. 244) *Streptospongia labyrinthica*, Ulrich.

Locality.—Near Lebanon, Kentucky.

Remarks.—This differs from the first described species mainly in form, being massive, instead of oval and free.

Only one fragment of a specimen was used by Mr. Ulrich in his description.

Order SPONGIDA.

One of the lowest orders of animals, consisting of an aggregation of minute beings, together forming a soft mass, with spiculæ of various forms, or having a silicious skeleton filled with sarcode; this sarcode or protoplasm traversed by tubes of varying size, serving to convey nourishment to the individuals of the mass.

As fossils the members of this order sometimes occur as amorphous and irregular masses (this is frequently the case in the Cincinnati group); sometimes the spicules forming the original skeleton are alone preserved; and sometimes the external frame-work is so well preserved that the species can be referred to existing orders or families. Generally it is necessary to study the minute structure by means of microscopic slides to determine the generic relations of the forms. Occasionally species occur in rounded or globular masses, which were evidently free growing, or attached by a single point to the rocks. Some were anchored in the mud by bundles of silicious spicules.

The modern arrangement of fossil sponges is by means of the spicules. In many of the genera found in the Cincinnati group, spicules have not been observed, and consequently any strictly scientific arrangement is not now practicable. That which follows is, therefore, largely, if not wholly, artificial, though it has been the endeavor to group together those genera of which the spicules are known, or which seem to belong together. There have been included in the group two anomalous genera, of uncertain position, viz: *Pasceolus* and *Receptaculites*, while another group, which has sometimes been placed with the sponges, *Stromatoporoidea*, is left for future consideration.

Key to Genera.

a. Free; conical, globular or cylindrical.

† Surface without plates.

1. *Astylospongia*—Round, unattached, with minute external pores; spiculæ star-shaped.

2. *Leptopoterion*—Obconical; surface annulated or reticulated.

3. *Microspongia*—Compact; radiate in structure and without large openings.

4. *Hindia*—Sphæroidal; a central space with spiculæ; canals opening at the surface.

5. *Cylindrocoelia*—Cylindrical; pointed or truncate, hollow.

6. *Rhombodictyon*—Globular or discoid; rods crossing each other nearly at right angles, thus forming rhombic spaces.

†† Surface with plates.

7. *Pasceolus*—Plates polygonal and without special arrangement.

8. *Receptaculites*—Plates arranged in intersecting lines; imbricated or cylindrical.

b. Body cavity hollow, sponge cup-shaped or funnel-form.

9. *Cyathophycus*—Hollow, cylindrical, with a reticulated structure.

10. *Chirospongia*—Hollow, general form hand-like; structure vesicular.

11. *Brachiospongia*—Body circular, cup-shaped, with spreading arms.

c. Amorphous.

12. *Pattersonia*—Irregular in form, generally compressed, and appearing as if a number were united.

13. *Dystactospongia*—Canals on exterior radiating from a common center.

d. Branching.

14. *Heterospongia*—Outer surface showing oscula and mouths of canals.

Genus I.—*ASTYLOSPONGIA*, Roemer, 1860.

Free, globular or spherical, and nearly circular. The inner tissue made up of very regular stellate bodies (spiculæ) united by their rays. Large canals radiate from the center to the circumference. These cross or are intersected by concentric canals. (Die Silur. fauna des West. Tenn., 1860, pp. 7, 8.)

Remarks.—Two species have been referred to this genus from the Cincinnati group, *A. tumidus*, James, and *A. subrotundus*, James. Neither of these seem to belong to *Astylospongia*. The first seems to be a species of *Pasceolus*, as there are indications of surface plates, and it is referred there provisionally. The second is possibly congeneric with *Hindia* or *Microspongia*. It is referred to the latter genus provisionally.

Genus 2.—LEPTOPOTERION, Ulrich, 1889.

Remarks.—This genus and its type species, *L. mammiiferum*, was founded upon a single specimen about three inches high, and a little more than half as wide at the top, and in such a poor state of preservation that, we are told, the “minute details of its structure have been almost obliterated by replacement with iron pyrites. The outer surface, where best preserved, is finely reticulated, being traversed by lines and series of points ranged in very regular diagonally intersecting, transverse and longitudinal directions.” (Am. Geologist, vol. 3, 1889, p. 239). Neither the genus nor the species can be recognized from the description. No figure has, as far as the writer knows, been published. The author of the species may, in the future, have further material to elucidate his species.

Locality.—Roh’s Hill, Cincinnati, O.

Genus 3.—MICROSPONGIA, Miller & Dyer, 1878.

“A free calcareous sponge, destitute of an epitheca. The texture is finely porous, without large canals or openings on the surface. Spicules (?) very minute and needle shaped.” (Jour. Cin. Soc. Nat. Hist., vol. 1, 1878, p. 37.)

The above is the very unsatisfactory definition of the authors. Nothing has been added to our information in regard to it since the description was published.

1.—M. GREGARIA, Miller & Dyer, 1878.

Small, gregarious, globular and calcareous; free, and without an epitheca. In structure fibrous or minutely porous, compact. Spicules (?) needle shaped. Varying in size from one-eighth to more than one-half an inch in diameter. (Jour. Cin. Soc. Nat. Hist., vol. 1, 1878, p. 37.)

Locality.—Cincinnati.

Remarks.—It is probable that *Hindia parva*, Ulrich, is a synonym for this species. It is described as "free, globular in form, with an even, rounded surface. Specimens vary between 5 and 10 mm. in diameter, but in a large proportion of the specimens seen the diameter varies but little from 7 or 8 mm.

"The radiating canals are a little smaller than in the common *Hindia spheroidalis* Duncan, of the Niagara, being as a rule not over 0.27 mm. in diameter." (American Geologist, vol. 3, 1889, p. 244). From this description it is impossible to separate the species from *M. gregaria*. Further study may prove it to be distinct.

2.—*M. (?) SUBROTUNDUS*, U. P. James, 1878.

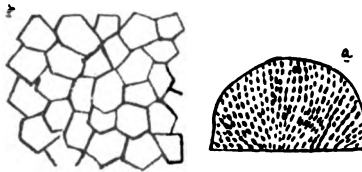


FIG. 1.—*M. (?) subrotundus*, James. a. One-half of a specimen showing internal structure; about three times natural size. b. Surface features, enlarged.

"Corallum small, free, subrotund. Cut polished sections in different directions show the corallites [canals] as growing from the center of the corallum [mass] outward in every direction and increased by fission. No tabulæ passing *through* the corallites [canals] apparent; they may be found, however, in other examples. Transverse dissepiments between the corallites [canals] strong. Calices unequal in size, some much larger than others, and an average of about eight in the space of a line. In the cut sections the spaces between the dissepiments appear like rows of minute pores, arranged longitudinally between the corallites [canals]." (The Paleontologist, Sept. 14, 1878, p. 11.)

Remarks.—The above is the original description of the species, at that time referred to as *Chateles subrotundus*, and regarded as a coral. Subsequently (Ibid, June 10, 1881, p. 34,) it was placed under *Astylospongia*, and so regarded as a sponge. The so-called calices apparently radiate from what might be

considered the "poles" toward the "equatorial" region. It is referred to *Microspongia* with doubt, as the minute structure of that genus has not, as far as known, been described.

Localities.—Ogden Station, Clinton County, Ohio. Specimens scarcely to be distinguished from it occur in strata of similar age on Little Maquoketa River, Iowa.

Genus 4—HINDIA, Duncan, 1879.

Free; central space occupied by spicules, soon forming a series of bifurcating, straight, radiating canals, opening at the surface. Spicules calcareous, more or less in form of a stemmed tripod with four limbs, and swollen or fringed at the edges, where junction with others take place. (*Annals and Mag. Nat. Hist.*, 5th ser., vol. 4, 1879, p. 91.)

Remarks.—The only species referred to this genus from the Cincinnati group as yet is *H. parva*, Ulrich. As already stated, that is apparently a synonym for *Microspongia gregaria*.

Genus 5—CYLINDROCÆLIA, Ulrich, 1889.

Free, cylindrical, with the lower end pointed or truncate. Hollow in the sub-cylindrical portion; walls thick, traversed by irregularly disposed, radiating canals; a few penetrate the thin dermal layer on the outer and inner surfaces, and when the dermal layer is worn away, the sub-circular mouths appear. (*American Geologist*, vol. 1, 1889, pp. 245, 246)

1.—C. COVINGTONENSIS, Ulrich.

Sub-cylindrical; tapering in a length of 45 mm. from a diameter of 25 mm. to one of 32 mm.; diameter of opening at lower end 6 mm., and at upper 22 mm.; wall varying from 3 mm. to 10 mm. in thickness; canals averaging 1.5 mm. in diameter, with an average of eight in a space 10 mm. square; canals penetrating the wall in an irregular manner. (*Ibid*, p. 247.)

Locality.—Covington, Kentucky.

Remarks.—This species seems almost entirely based upon size. The diameters of the specimens, the thickness of the walls, and the size of the canals are given with great minuteness. All other features seem to be lacking. Three other species belonging to the genus are described in the volume

quoted, and they are also based mainly upon size. None of them are from the Cincinnati horizon. Probably all the species are fragments of one. They certainly possess few recognizable characters, according to the descriptions.

Genus 6.—*RHOMBODICTYON*, Whitfield, 1886.

"Globular, discoid or broadly cyathiform fossil bodies, composed of two or more sets of more or less rigid rods or threads, crossing each other at various angles, but not bifurcating or dividing, and leaving rhombic spaces, which are filled with carbonaceous or other substance." (*Bull. Am. Mus. Nat. Hist.*, Central Park, vol. 1, 1886, p. 347.)

Remarks.—Two species and one variety are described by Professor Whitfield, and referred to this genus. Its affinities are stated to be with the Dictyophytens. The following species is as yet the only one recorded from the Cincinnati group:

R. GLOBOSUS, n. sp.

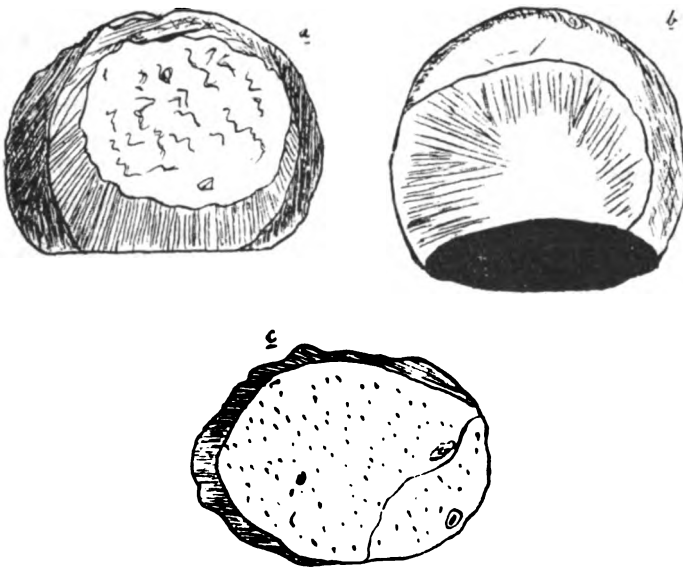


FIG. 2.—*Rhombodictyon globosus*, n. sp. a. Showing one face of specimen, with radiating lines. b. Opposite side of same specimen. c. Ground surface showing pit-like markings.

Sponge body ovoid in form, $1\frac{3}{4} \times 1 \times 1\frac{3}{8}$ inches, the lower portion having been ground off to observe the interior. A series of lines are observable on different parts of the specimen, running parallel with each other, without any seemingly definite starting point, not bifurcating, and in some cases with very fine lines crossing at right angles. Where ground off the specimen shows no structure except numerous small pits, small particles of carbonaceous matter and some irregular lines. Nothing that can be considered spiculæ have been observed, unless the parallel lines be regarded as such.

Locality.—Cincinnati, Ohio.

Remarks.—The specimen upon which this species is founded is in the collection of the late Mr. U. P. James, and was referred by him to "*R. discum*, Whitfield (?)" It differs from that species in the much larger size and different form. The exact horizon of the specimen is unknown.

Genus 7—PASCEOLUS, Billings, 1857.

Free, ovate or subglobular; exterior surface marked by polygonal plates and with one or more circular apertures; base with or without point of attachment. (Rept. Prog. Geol. Sur., Canada, 1853-'54-'55-'56-'57, p. 342.)

Remarks.—The zoological affinities and position of the genus are uncertain. It has been placed among the Tunicata, the Foraminifera, and in the place here given to it. The probabilities seem in favor of its being one of the Spongida. It was so placed in a previous article, "*Protozoa of the Cincinnati Group*," by the present writer (Jour. Cin. Soc. Nat. Hist., vol. 9, 1887, p. 248). A similar form, *Cyclocrinus*, was regarded as a Cystidian, and as also one of the Zoantharia.

1. *P. GLOBOSUS*, Billings, 1857.

Hemispherical or subglobular; two or three inches in diameter, base flattened, plate (?) impressions polygonal, or hexagonal, about two lines in diameter and without external openings (Geol. Sur., Canada, Rept. Prog., 1853-'54-'55-'56-'57, p. 343).

Locality.—Cincinnati, Ohio.

Remarks.—This is mainly a Trenton species, but it has been found in a few localities about Cincinnati.

2. *P. DARWINII*, Miller, 1874.

Upper half of body hemispherical, about $1\frac{1}{4}$ inches in diameter, lower half slightly depressed, and with a central, circular depression; the entire outer surface marked by crowded pentagonal and hexagonal depressions, about one line in diameter; frequently compressed and at times covered with a polyzoan; internal structure unknown. (Cin. Quart. Jour. Sci., vol. 1, 1874, pp. 5, 6. *P. claudii*, Miller, 1874. Ibid., pp. 6, 7.)

Localities.—Cincinnati, Ohio, and Maysville, Ky.

Remarks.—The above two species have been generally considered distinct, but the justice of the separation is doubtful. The general shape is the same in both, as are also the condition of preservation and the form of the external markings. *P. globosus* is generally a little the larger; otherwise there is scarcely any difference. *P. claudii* is doubtless the young form. Its description is: "Body spherical, without any depression where the column or pedicle was attached. Entire surface marked by closely crowded pentagonal or hexagonal depressions, about $\frac{1}{80}$ of an inch in diameter. Diameter $\frac{1}{2}$ to $\frac{3}{4}$ of an inch.

"It differs from *P. darwinii* in size, and in having no depression where the pedicle was attached. It is possible that it might be the young of *P. darwinii*, but at present I think it is a distinct species." It is associated with *P. darwinii* at Maysville, Ky. Later investigations do not seem to have changed Mr. Miller's belief that it forms a distinct species, for it is so regarded in his North American Geology and Palæontology, 1889, p. 162.

3. *P. (?) TUMIDUS*, U. P. James, 1878.

Fig. 3.—*P. (?) tumidus*, James. More or less diagrammatic sketch of the plates on upper surface.

"Subglobose, more or less depressed, with a shallow cavity on one side. Surface rough and generally covered with pit-like markings; sometimes quite distinctly lobed; examples examined not very satisfactory," (The Paleontologist, No. 1. July 2, 1878, p. 1.)

The above is the original description. Some specimens examined show a series of hexagonal plates with depressed lines running from the center to the six corners. Owing to the crushed conditions of the specimens, these plates sometimes appear round or oval. Internal structure unknown.

Locality. - Cincinnati, Ohio.

Remarks.—This species was originally described as *Astylospongia tumidus*. It is referred here to *Pasceolus* with a query, since it seems more nearly related to that genus than *Astylospongia*. The form needs fuller investigation.

Genus 8.—RECEPTACULITES, DeFrance, 1827.

"Cup or platter-shaped bodies of considerable size, with walls of definitely arranged spicules. The outer surface is formed by the rhomboidal head plates of the spicules; beneath these are the horizontal rays and robust sub-cylindrical vertical rays, which are connected with an inner layer or perforated plate. Communication with the exterior was carried on between the margins of the summit plates of the spicules on the outer surface, and through the cylindrical canals of the inner surface layer, or, according to Gümbel, through inter-marginal canals." (G. J. Hinde, on Receptaculitidæ, Quart. Jour. Geol. Soc., Lond., vol. 40, 1884, p. 826.)

Remarks.—The genus was originally described by DeFrance in 1827 (Dictionnaire des Sciences Naturelles, Tome 45, p. 5). Its position in classification has been a matter of dispute, and it is still very doubtful. Hinde (Ibid) concluded it belonged to the sponges. Billings (Palæozoic Fossils, vol. 1, 1865, p. 386) thought its affinities were with Foraminifera; while other writers have considered it a cystidean, a coral or a tunicate mollusk. Nicholson and Lydekker (Manual of Palæontology, vol. II, 1889,) do not consider its position as at all definitely settled. For a full discussion of the family and its affinities, consult Hinde's paper as above, and for details of the structure of the genus, the remarks of Billings, also referred to above.

The genus *Ischadites* is considered distinct by Hinde, but some other authors place it as a synonym.

From the Cincinnati group Mr. E. O. Ulrich has described two genera, *Anomaloides* and *Lepidolites*, which are here considered as congeneric with *Receptaculites*. In order that others may judge, the essential features of the two genera are given below.

Anomaloides, Ulrich, 1878:—Hollow, conical, compressed bodies; composed uniformly of elongated, cylindrical, spine-like bodies, which are placed parallel with each other and perpendicular to the surface. The affinities of the specimens were supposed to be with the Echinodermata. (Jour. Cin. Soc. Nat. Hist., vol. 1, 1878, p. 92.)

Mr. S. A. Miller places the genus with the Echinodermata, and remarks that the word was constructed upon two adjectives, and founded upon a fragment not understood. (N. Am. Geol. & Palæontology, 1889, p. 224). An article among the editorial comments in the American Geologist (vol. 1, 1888, p. 324), says, that to place *Anomaloides* with *Receptaculites* "is simply ridiculous." Had the writer of that paragraph turned to page 381 of Billings's Paleozoic Fossils, volume one, and compared figure 354 with that given on Plate IV., figure 6 b. of vol. 1 of the Journal of the Cincinnati Society of Natural History, he would have found some resemblance. Turning to page 380 of Paleozoic Fossils, he would have read: "The tubular skeleton [of *Receptaculites*], above alluded to, consists of numerous small, straight, rarely curved, cylindrical tubes, or hollow spicula, placed parallel to each other, and at right angles to the planes of the body wall, of which they form the greater portion." These words are almost exactly those used by Mr. Ulrich in his definition of the genus. The two figures referred to are reproduced below for comparison.

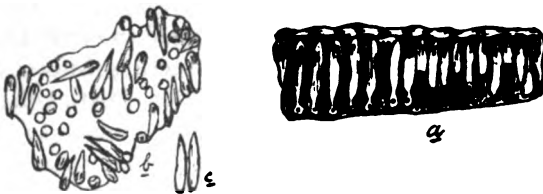


FIG. 4.—a. *Receptaculites* (after Billings). b. *Anomaloides* (after Ulrich). c. Two pillars of *Anomaloides*.

Mr. Ulrich's definition of *Lepidolites* is, in substance, as follows: Much flattened, calcareous bodies, sub-spherical, or sub-cylindrical in form. Hollow, with a thin envelope of imbricated plates or scales. The lower (?) end has an indentation, while the corresponding portion of the interior is raised into a small cone. The interior of the sack appears to be lined with a very thin and delicate integument, to the outer surface of which the scales are attached. (Jour. Cin. Soc. Nat. Hist., vol. 2, 1879, pp. 20, 21.)

The writer in the *Geologist* already quoted admits that *Lepidolites* belongs to the *Receptaculitidae*, but denies it is congeneric with *Receptaculites*. We are inclined to regard it as belonging to the genus as above, considering it likely to be the outer integument, named by Mr. Billings the "ectorhin." In his general remarks upon *Receptaculites* Mr. Billings refers to the form as being discoid, cylindrical, ovate or globular and hollow. "In or near the center of the lower side there is generally to be seen a small rounded protuberance" (p. 379), and from this the plates radiate in curved lines. The "ectorhin" is described as "usually composed of numerous small rhomboidal plates closely fitting together, and arranged in curved rows, which radiate in all directions from the nucleus outwards. * * * It seems probable that, in some of the species, this integument was of a flexible, coriaceous consistence." This description coincides with the features of *Lepidolites*, Ulrich, and we should consider that genus as founded upon an example of the coriaceous membrane referred to by Mr. Billings.

I. R. RETICULATUS, Ulrich, 1878.

Hollow; composed of an aggregation of subcylindrical or club-shaped stems, parallel to each other, and perpendicular to the surface; inner ends acutely pointed; outer ones rounded, and with a minute pit; arranged in curved or flexuous transverse and diagonally intersecting lines. (*Anomaloides reticulatus*, Ul., Jour. Cin. Soc. Nat. Hist., vol. 1, 1878, p. 92.)

Locality.—Covington, Kentucky.

Remarks.—For remarks upon this, see after description of the genus above.

2. R. DICKHAUTI, Ulrich, 1879.

As found, this species was flattened from a subspherical, subpyriform or subcylindrical shape. Integument bearing the plates very thin, $\frac{1}{100}$ of an inch thick, and probably flexible. Plates imbricated, the exposed margin rounded, arranged in concentric lines crossing each other in a quincuncial manner; smaller about the central indented portion, enlarging toward the upper portion. Detached plates cuneiform, the widest end being exposed. (*Lepidolites dickhauti*, Ulrich, Ibid., vol. 2, 1879, p. 21: *L. elongatus*, Ul., Ibid. p. 22.)

Locality.—Covington, Kentucky.

Remarks.—The difference between *L. dickhauti* and *L. elongatus*, is mainly one of size. There does not seem to be enough difference to constitute two species.

3. R. CIRCULARIS, Emmons, 1856.

"This coral is in a form of a thick, flattened ring, studded with circular cells, arranged in regular lines traversing it rather obliquely." (American Geology, part 2, 1856, p. 230.)

Locality.—Lorraine Shales, New York.

Remarks.—The above meager description is scarcely sufficient to enable one to identify the species. The figure given shows a half circle, depressed in the center and elevated toward the rim, with numerous pit-like markings scattered irregular over the surface.

Genus 9. CYATHOPHYCUS, Walcott, 1879.

"Hollow membranous fronds, with an opening at the upper extremity of the frond, elongate or hemispherical in form; reticulate or plain structure" (Trans. Albany Institute, vol. 10, 1879, p. 18).

Remarks.—The above is the original description of the genus. It was, at the time, supposed to be an Alga, but specimens secured at a later date showed it to be a true sponge. This was stated in the Am. Jour. of Science, 3d ser., vol. 22, 1881, pp. 394, 395, where Mr. Walcott says that "the reticulate structure mentioned in the original description was found to be formed of a horizontal and perpendicular series of narrow bands crossing each other at right angles, so as to form a net

work with rectangular interspaces, the narrow bands being formed of thread-like spiculæ resting on, or one against the other. The spiculæ differ in size; some are filiform, while others are stronger and more prominent." The species described by Mr. Walcott are from the Utica, State of New York. That described below as a new species is from rocks of Cincinnati group age.

C. SILURIANA, n. sp.

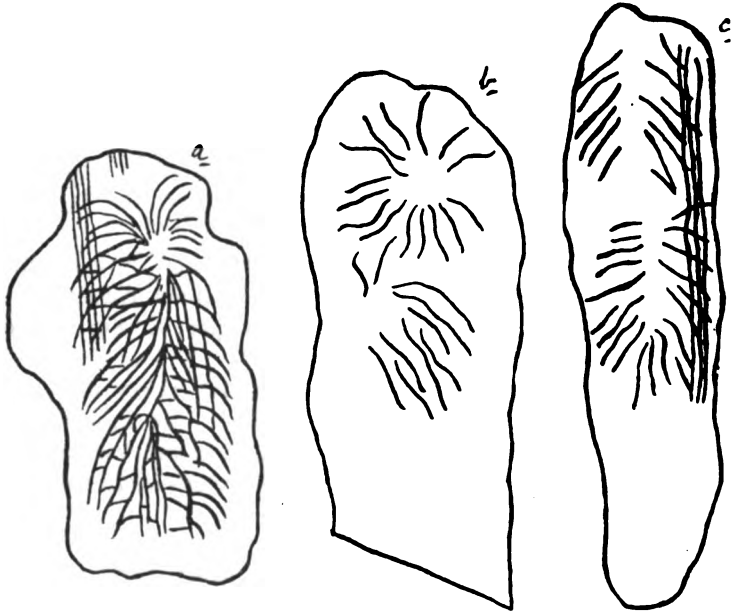


Figure 5.—*Cyathophycus siluriana*, n. sp. a, type specimen showing the net work formed by cross and perpendicular or oblique lines; b and c two other specimens not so well preserved.

Rounded or flattened cylindrical bodies, varying from one to two and one-half inches in length, and about one inch in width; outer surface marked by longitudinal lines starting from a common point at one end, and radiating in the form of a cup; numerous transverse lines crossing the longitudinal ones and so forming an irregular net work. The internal structure seems to be entirely lacking, the center being filled with clay, and only a portion of the frame work remains.

Locality.—Cincinnati.

Remarks.—This species is founded upon some specimens in the collection of the late Mr. U. P. James. They had been considered by him as fucoids, but the presence upon the outer surface of well-defined markings has caused them to be referred to the Spongida. Whether the form is congeneric with *Cyathophycus* is perhaps a matter of doubt. But the different state of preservation of the Utica slate species, and this one, may account for the variation. This is preserved in a calcareous matrix, while the others occur in a fine-grained black slate at Utica, New York. The species presents also a resemblance to the forms of *Rauffellia*, Ulrich, 1889.

Genus 9.—CHIROSPONGIA, S. A. Miller, 1889.

“General form hand-like, or somewhat like a compressed goblet; composed of internal filamentous or fibrous substance, which is covered with a thin, lobed, vesicular parenchyma.” Fastened to the bottom by an expanded base; above, forming a flattened, obconoidal cup, with deep sulci down each side; hollow; skeleton vesicular or porous; spicules supposed to resemble those of *Brachiospongia*. (N. Am. Geology and Palæontology, 1889, p. 156.)

Remarks.—This is an indefinite and poorly defined genus. The one species from the Cincinnati group referred to it is *C. faberi*, but the type is *C. wenti*, from the Trenton, near Frankfort, Kentucky.

1.—*C. FABERI*, S. A. Miller, 1889.

“This species is founded upon a calcareous fragment of the parenchyma, about one-third of which is shown in the figure [not here given]. It is thin, and belonged to the side of a large, hollow specimen. The semi-elliptical lobes are nearly equal in size, and regularly distributed in rows over the surface. The surface is reticulated with fine papillæ, presenting to the naked eye the appearance of a bryozoum.” (Ibid, pp. 156, 157.)

Locality.—Cincinnati, O.

Remarks.—This species, like the genus, is obscure. It was founded upon a fragment, and would be almost impossible to

recognize from either description or figure. Besides the latter is wrongly engraved and would thus mislead the student. No indication whatever is given of the general form of the organism, nor of the presence or absence of spicules. There is scarcely anything that indicates a relationship to the type of the genus, unless it be the lobes, of which, however, no adequate idea can be formed.

Genus II.—BRACHIOSPONGIA, Marsh, 1867.

“Sponge in the form of a broad cup or vase, with a row of projecting processes or arms around the periphery of the base, and into which the gastral cavity extended. Osculum large, not operculate. Afferent and efferent canal system well developed.” (Beecher, C. E., Memoirs Peabody Mus., Yale Univ., vol. 2, 1889, p. 13.)

Remarks.—This genus was first described by O. C. Marsh in Am. Jour. Sci., 2d ser., vol. 44, 1867, p. 68. The description given above is from a monograph of the Brachiospongiadæ by Dr. C. E. Beecher. The description of the first species is from the same paper.

1.—*B. DIGITATA*, Owen (sp.), 1857.

Broad, cup-shaped, or short vasiform, with a row of eight to twelve arms projecting outwards and downwards from periphery of base. Osculum elliptical; below osculum, walls of cup or neck vertical, extending from 25 mm. to 40 mm., and slightly expanding below to origin of arms. Base of cup concave, usually with strong conical or mammiform projec-

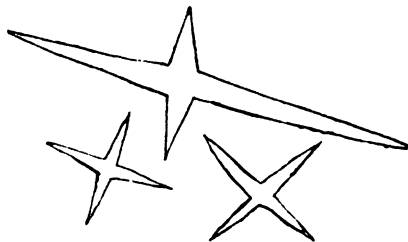


FIG. 6.—*Brachiospongia digitata*, spicules, from inner surface (after Beecher).

tion near the center. Arms nearly circular, extending outward or upward, terminating in a compressed extremity, and when perfect closed at the distal ends. Spicules cruciform. (Beecher, *Ibid*, pp. 19-20.)

Localities.—Franklin County, Kentucky; (?) Wilmington, Ohio.

Remarks.—This species was first described by Dr. D. D. Owen, in *Geol. Sur. of Kentucky*, vol. 2, 1857, p. 111, as *Scyphia digitata*. Only one or two specimens in any way perfect have ever been found. One of these is in the State Museum at Frankfort. Excellent illustrations of the species are given in Nettelroth's *Kentucky Fossil Shells*, and in Beecher's *Memoir*, above quoted. Mr. E. C. Went, of Frankfort, was fortunate enough to find the fossil *in situ* on Cedar Run, about $2\frac{1}{2}$ miles south of Frankfort, and he has found a large number of fragments, but no perfect specimens. Its horizon is given by Nettelroth as the lower beds of the Cincinnati group, though it has generally been regarded as a Trenton form. Dr. Beecher was the first to describe and figure the spicules, some of which are shown in a figure given above. *B. lyoni* Marsh, *B. roemerana* Marsh and *B. hoveyi* Marsh are synonyms.

A second species of this genus was described by Mr. U. P. James under the name of *B. tuberculata*. (*The Paleontologist*, No. 4, July, 1879, p. 25). The description is essentially as follows: "Fossil consisting of a sub-circular body with nine arms projecting horizontally somewhat like the spokes of a wagon wheel, and when placed upon its edge has some resemblance to a clumsily constructed, massive wagon-wheel, destitute of tire and felloes. The body is between five and six inches in diameter, one arm broken off close to the body, the others left from one to two inches in length, all having been broken away to such lengths; but the broken, detached end of one was found, which fits closely to the place of fracture, and makes the length of that arm $3\frac{1}{2}$ inches, where it bifurcates; length of *branches* of that arm unknown, both being broken away just beyond the bifurcation. The specimen is about two inches thick through the thickest part of the body, and the arms [are] from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in diameter at their junction, tapering very little, if any, to the fractured ends, except where weathered; in fact, the one showing

the bifurcation thickens towards the end, and is two-fifths wider at the bifurcation than where it starts from the body.

"Prominent tubercles, from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch above the general surface, from $\frac{1}{4}$ to $\frac{1}{2}$ an inch broad at their bases, and from $\frac{1}{4}$ to $\frac{1}{2}$ an inch apart at the bases, are distributed irregularly over the surface of the body and arms, also a few pit-like cavities of irregular shapes. One side has, evidently, been exposed to the weather and action of water for some length of time, and become somewhat worn away; on the worn portion the tubercles are all removed. The general surface of the fossil is rough, but with a good magnifier it is difficult to determine whether the roughness may have been caused by pores; the appearance resembles fine papillæ, but I am unable to detect any openings; and the internal structure, at the fractures, seems destitute of any organized arrangement; it is compact and granular-like in appearance."

It differs from *B. digitata*, it is said, in the arms projecting directly outward from the body and in not tapering; and in the possession of tubercles. The locality is given as a branch of Todd's Fork, near Wilmington, Ohio.

I have not been able to see the specimen from which the above description was made. It would seem to be the same as *B. digitata*. Its occurrence in Ohio, if the locality be correctly given, and in beds of the upper portion of the Cincinnati group, is interesting, as it greatly extends the range of the genus in time and in area. Dr. Beecher does not seem to have been aware of this form, and nowhere makes any reference to it.

Genus 12.—PATTERSONIA, S. A. Miller, 1882.

"A solid, amorphous, calcareous sponge, uniform in structure, vesicular, and destitute of larger canals and openings. Spicules (?)." (Jour. Cin. Soc. Nat. Hist., vol. 5, 1884, p. 43.)

Remarks.—The above is the original description given of the genus. In 1889 Mr. Miller (North American Geology and Palæontology, p. 163) enlarged it as follows: "Solid, amorphous; no large openings; lobed, pendent expansions on the upper surface, and bundles of fine filaments at the base, and in the interior, which do not merge into the parenchyma of the sponge; spicules unknown." It is probable that this genus

and *Chirospongia* are closely allied, if not identical. At all events the genus *Strobilospongia* Beecher, an undoubted synonym of *Pattersonia*, is very similar to *Chirospongia*. The description of Beecher's genus is given below.

Strobilospongia, Beecher, 1889:—"Sponge cyathiform or globose with more or less concentric rows of lobes or lobed expansions, on the surface. Anchored to the sea bottom by massive bundles of filamentous spicules (basalia) proceeding from the interior of the base of the cup. The bundle of basalia is well defined at its origin and does not merge into the tissues of the sponge." Spicules cruciform (Memoirs Peabody Mus., Yale University, vol. 2, 1889, p. 14). This differs from the original definition of *Pattersonia*, and is a good supplement to it.

1. *P. DIFFICILIS*, S. A. Miller, 1882.

"Whether the original form of this sponge was globular or not, we are unable to determine, but as we find it now, it consists of a flattened irregular mass, often appearing as a cluster, but no two specimens having the same form. It is vesicular in structure, and under a magnifying power of 800 diameters, bodies are observed somewhat resembling acicular crystals in the plant *Fuchsia*, and also a few scattering subcircular or sub-elliptical forms with irregular outlines, which I have been unable to class as spiculæ" (Jour. Cin. Soc. Nat. Hist., vol. 5, 1882, pp. 43, 44).

Locality.—Cincinnati, Ohio.

Remarks.—Nothing has been added to our knowledge of this form since the original description as given above.

2. *P. TUBEROSA*, Beecher, (sp.), 1889.

Somewhat conical, flattened and deeply indented on opposite sides, from the base to the osculum. Otherwise surface covered with slightly pendent, solid, tuberoso extensions of the parenchyma. Summit flattened, osculum irregular, sinuous, margin thin, sometimes convoluted. Base broad, penetrated by mass of basalia or root tuft of anchor spicules. Height from 70 to 80 mm. Spicules cruciform, but very imperfectly preserved (Beecher, 1889, op. cit., p. 26).

Locality.—Turners Station, Kentucky.

Genus 13.—DYSTACTOSPONGIA, S. A. Miller, 1882.

"This is a massive, more or less regularly hemispherical, fixed, calcareous sponge. It possessed a frame work that radiated from one or more points of attachment, and bifurcated without any determinable order, so as to constitute a great part of the body of the sponge. The entire mass is vesicular, the frame work being more dense than the intervening spaces. Spiculæ not ascertained" (Jour. Cin. Soc. Nat. Hist., vol. 5, 1882, p. 42).

Remarks.—Nothing further has been added to our knowledge of this genus.

1. *D. INSOLENS*, S. A. Miller, 1882.

"Sponge large, irregular, somewhat hemispherical, and varying from two to four or five inches in diameter. The architectural frame work radiates from several different points of attachment, and divides and subdivides without order, and constitutes more than two-thirds of the entire mass. As seen under the higher powers of the microscope, the structure is vesicular throughout, and full of amœba-like outlines which may possibly represent spiculæ * * * * *

Under a power of 800 diameters the vesicles are observed to contain numerous subcircular, subelliptical and amœba-like bodies, with irregular outlines, but I am not able to say that they are spiculæ or fragments of such forms."

Locality.—Cincinnati, Ohio.

2. *D. MINIMA*, Ulrich, 1889.

"Proposed for a small parasitic sponge, apparently congeneric with *D. insolens*, S. A. Miller. It forms thin crusts or small irregular masses upon bryozoa [polyzoa] and other foreign bodies. The largest seen is about 15 mm. wide, and 5 mm. high at the centre. The canals are much smaller than in any of the other species, and the partitions exceedingly thin. About five canals occur in two mm. The whole skeleton is usually replaced by a brown oxide of iron" (American Geologist, vol. 3, 1889, p. 243).

Locality.—Hanover, Butler Co. Ohio.

Remarks.—This species, though parasitic, is considered

congeneric with *Dystactospongia insolens*, regarded as a massive form. The description is meager and vague, and unaccompanied by an illustration. This renders it difficult to recognize the species. Future studies may furnish further information.

Genus 14.—HETEROSPONGIA, Ulrich, 1889.

Sub-lobate, or with irregularly divided, compressed branches. "Entire surface exhibiting the mouths of branching and more or less tortuous canals, which begin near the center, where they are nearly vertical, and proceed toward all portions of the surface in a curved direction. A limited number of 'oscula,' distinguished from the ordinary canals by being larger and surrounded by radiating channels, occasionally present.

"Sponge skeleton between the canals of variable thickness, sometimes appearing nearly solid, at other times composed of loosely interwoven spicule fibers. None of the specimens show the spicules in a satisfactory manner. From the traces seen it would appear that they are mostly very small, and of the three rayed type." (Ibid, pp. 239, 240.)

Remarks.—Mr. Ulrich considers this genus related to the preceding, *Dystactospongia*, remarking that the *four or five species* of Miller's genus known to him are parasitic, or form amorphous masses. But two species of *Dystactospongia* have so far been described.

1.—H. SUBRAMOSA, Ulrich, 1889.

Sub-ramose or palmate; branches more or less flattened, from 9 to 13 mm. thick and from 11 to 30 mm. wide; surface generally even, with irregularly distributed canal apertures; these of varying size, the average diameter being 0.7 mm., with five in five mm.; space between apertures varying from 0.2 mm. to 1.2 mm.; sponge skeleton composed of more or less loosely interwoven fibers, though the interspaces generally appear solid and structureless; spiculæ undetermined. (*H. knotti*, Ulrich, 1889.) (Ibid, pp. 240, 241.)

Locality.—Marion and Lincoln Counties, Kentucky; Cincinnati, Ohio (?), and Spring Valley, Minn. (?).

Remarks.—We have placed *H. knotti* as a synonym of this

species, as there is not sufficient difference between the two to justify a separation. The only essential difference is the occurrence in *H. knotti* of oscula, which are scattered over the surface, these being absent from *H. subramosa*. The imperfect preservation, however, might readily account for the absence of these in the latter species. The canals, too, are smaller in *H. knotti* than in the other. Both occur in the same locality in Kentucky.

2.—*H. ASPERA*, Ulrich, 1889.

Irregular in growth, "forming thick, shapeless fronds or strongly nodulated, lobate or sub-ramose masses, several inches in length." When well preserved, the surface rough, the spaces between the canals thin and with sharp prominences at intervals; canal apertures irregular, often sub-quadrangle, 0.5 mm. in diameter, with 7 or 8 in 5 mm.; in the nodular examples, canal mouths sometimes disposed in a radial manner, but without oscula at the center of the area; canal apertures sometimes wanting. (Ibid, pp. 241, 442.)

Locality.—Marion and Lincoln Counties, Kentucky.

THE JOURNAL

- OF THE -

Cincinnati Society of Natural History.

VOL. XIV.

CINCINNATI, JULY, 1891

No. 2.

PROCEEDINGS.

REGULAR MEETING, April 7, 1891.

The Society was called to order at 8.10 P. M., President Abert in the chair.

The minutes of the February meeting, and of the informal meeting of March 3, were read and approved.

The following names were proposed for active membership, and under a suspension of the rules were elected.

Mrs. Jas. LeBoutillier, George Gregg Johnston, Alex Starbuck, Jas. Brown Kemper, E. T. Flynn, Leo. Block, Jr., Chas. A. Stevens, Jeptha Garrard, J. T. Helleberg, Davis C. Anderson, Dr. Albert H. Ehrman, Chas. A. Beecher and Richard Nelson.

Previous to the election of the above-named members, Mr. Chas. Dury read a paper on the "Travels and Adventures of Mr. Wm. Doherty (a corresponding member of the Society) in Europe and Asia," which was listened to with marked attention and pleasure.*

The minutes of the Executive Board were read.

The resignations of Miss Fannie Field, Miss Elsie Field, Chas. G. Comegys, E. W. Gunckel, John M. Newton, Chas. Pettibone, Anton Schroeter, Jerome Clark and Rev. Reverdy Estill were read and accepted.

*Published in April number of this JOURNAL.

The deaths of C. F. Low and S. E. Wright, old members of the Society, were announced, and the resolutions of respect adopted at the informal meeting of March 3, in reference to same, were adopted.

The reports of the Treasurer, Secretary, Librarian, Director of the Museum, and Curator of Photography were read.

Maj. J. Ralston Skinner made a few remarks in reference to the work and progress of the Society and its future.

The election of officers for the ensuing year came next in order, with the following result:

PRESIDENT, COL. J. W. ABERT.
 FIRST VICE-PRESIDENT, A. DENNISTON SMITH.
 SECOND VICE-PRESIDENT, DR. F. W. LANGDON.
 TREASURER, DAVIS L. JAMES.
 SECRETARY, DR. JAS. A. HENSHALL.
 LIBRARIAN, WM. H. KNIGHT.
 TRUSTEE, WM. P. ANDERSON.

Members of Executive Board at Large.—

ALEX. STARBUCK, T. B. COLLIER,
 T. H. KELLEY, W. H. KNIGHT.

CURATOR OF GEOLOGY, E. O. ULRICH.
 CURATOR OF BOTANY, D. L. JAMES.
 CURATOR OF ZOOLOGY, CHAS. DURY.
 CURATOR OF ANTHROPOLOGY, Dr. A. J. HOWE.
 CURATOR OF PHOTOGRAPHY, T. B. COLLIER.
 CURATOR OF MICROSCOPY, DR. B. M. RICKETTS.
 CURATOR OF PHYSICS, W. H. KNIGHT.
 CURATOR OF CHEMISTRY, PROF. K. LANGENBECK.

The President then appointed the Auditing Committee as follows: Geo. Bullock, T. H. Kelley and T. B. Collier.

On motion, the paper of Mr. Chas. Dury on Wm. Doherty was referred to the Publishing Committee.

On motion, the reports of the Secretary and Treasurer were referred to the Auditing Committee.

Adjourned.

REGULAR MEETING, May 5, 1891.

The Society was called to order at 8.15 P. M., President Abert in the chair.

The minutes of the last meeting were read and approved.

The following were proposed for active membership:

Wm. V. Ebersole, Chas. E. Smith, J. Augustus Knapp and Miss Effie V. Ryan.

The report of the Trustees was read by the Secretary, and on motion was referred to the Auditing Committee.

The following resignations were read, and on motion accepted. Miss Lily Hollingshead, Dr. Wm. Owens, Jr., C. J. Stedman, Henry A. Gleick and C. H. Sheen.

The Society listened with decided interest to Dr. M. H. Fletcher's paper on "The Skin and its Appendages" illustrated by photo-micrographs.

Adjourned.

REGULAR MEETING, June 2, 1891.

The Society was called to order at 8.05 P. M., President Abert in the chair.

There were twenty-six persons present.

The minutes of the last meeting were read and approved.

Chas. E. Smith, Wm. V. Ebersole, J. Augustus Knapp and Miss Effie V. Ryan were elected to active membership.

The minutes of the Executive Board for April were read.

The Auditing Committee reported that, upon examination, the books and accounts of the Treasurer, Secretary and Trustees were found correct.

Upon motion, the report was accepted and the Committee discharged.

Mr. Warren K. Moorehead then read a very interesting paper, entitled "Some Recent Discoveries at Fort Ancient," which was received by the audience with great pleasure, and elicited much favorable comment.

Mr. W. H. Knight then read an instructive and interesting paper on "The Bright Star Arcturus."*

President Abert made some timely remarks on the importance of obtaining a building site for a new museum in Eden Park.

*Published in *Scientific American Supplement*.

Dr. O. D. Norton called attention to a well being bored near Wheeling, W. Va., over 4,000 feet in depth; he also spoke of some fossil bird tracks at an unusual horizon in Massachusetts.

The resignations of Miss Laura J. Frank, Miss Amanda Frank, Dr. J. L. Anderson and William Archer were read and accepted.

Adjourned.

DONATIONS TO JULY 1, 1891.

The Paul Mohr Collection of Minerals, Fossils and Pre-Historic relics, numbering nearly 20,000 specimens, and given to the Society by the following named persons, who subscribed the amounts placed after their names, as follows:

T. H. Aldrich,	\$100	R. Mitchell,	\$10
Mrs. L. Anderson, Sr., . .	50	Christ. Moerlein,	100
Eugene Bliss,	25	Joseph R. Peebles' Sons, .	10
Julius Balke,	25	J. G. Schmidlapp,	200
Robert Clarke,	50	Mrs. Chas. Schmidlapp, .	100
Julius Dexter,	100	Thos. Sherlock,	100
Albert Erkenbrecker, . .	50	W. W. Seeley,	50
Charles Fleischmann, . .	100	Albert Schwill & Co., . .	50
Julius Freiburg,	25	Ed. Senior,	50
T. T. Gaff,	50	J. R. Skinner,	25
Gambrinus Stock Co., . .	25	Mr. and Mrs. B. Storer, .	50
H. Goepper & Co., . . .	50	Volksblatt Co.,	25
Chas. Hofer,	100	James Walsh & Co., . . .	25
Kauffman Brewing Co., . .	25	M. Werk,	25
Chas. H. Kellogg, Jr., . .	100	J. L. Workum,	25
James Levy & Bro., . . .	200	Windisch, Muhlhauser &	
C. F. Lunkenheimer, . .	25	Co.,	50
Maddux, Hobart & Co., .	25	O. J. Wilson,	100
Alex. McDonald,	100	Paul Mohr,	2,755
Robert Meier,	25		

Making \$5,000, the price asked for the collection.

From Wilbur Dubois: Head of Horned Rabbit, from Edwards, Kansas.

Col. J. W. Abert: 1 specimen Red Granite, Wild Bad., Ger.; 1 specimen Flint, Cherbourg Harbor; 1 specimen Gold Ore (Quartz), Sawyer Mine, Maryland; 1 specimen Gold Ore, Senator Sawyer's Mine, Maryland; 1 specimen Travertine, Heal-

ing Springs, Bach County, Va.; 1 specimen Gold Ore (Pulverized), Dos Cabezas Mine, Arizona; 1 specimen Silver Ore (Pulverized), Silverton, Colorado; 1 specimen Gold Ore, Old Montgomery Mine, Maryland; 1 specimen Feld-spar, Wild Bad., Ger.; 1 Photograph of Col. Abert as a sculptor.

C. E. MacFarlan: A miscellaneous collection of Fossils and Minerals.

Wm. R. Jolly: Unios and Turtles, White River, Ind.

T. H. Aldrich: Photograph of Leaf Insect.

E. O. Hurd: Mallard Duck (Mounted), Tenn.

T. B. Keating: Section of deposit in water pipe, from Walker's Brewery.

Dr. O. D. Norton: 14 specimens of Minerals from Mountain Park, Hot Springs, North Carolina.

Robt. Newlin: Luna Moth.

Otto Laist: A collection of fine specimens of Minerals from Lake Superior.

BOOKS AND PAMPHLETS.

From Chas. Schuchert, author: "List of Species of American Palæontology: Orthis, Spirifera, Spiriferina and Syringothyris;" "On Syringothyris Winchell, and its American Species," 1890 (9th Annual Report, New York State Geol.).

E. Dufosse, Paris, Oct. 20, 1890: Americana (Catalogue), Series 7, No. 4.

Hon. Ben. Butterworth: Reports of U. S. Consuls, 1890; Reports of Com. Agriculture for 1887; 4th and 5th Reports Bureau Animal Industry, 1887-88; U. S. Experiment Station Record, November, 1890; U. S. Geol. Report, 1885-86; U. S. Geol. Report, 1886-87, Parts 1 and 2; Report Secretary Interior, Vol. 3, 1886-87; Report Bureau Ethnology, 1884-85; Smithsonian Report, 1887, Parts 1 and 2; U. S. Map of States and Territories; Report National Academy Sciences, 1888; Fruit Culture in Foreign Countries, 1890; Memoirs National Academy of Sciences, Vol. IV., Part 2, 1890; Report of Secretary of Interior, Vol. II., 1890; Smithsonian Report, 1888; Numbers and Values of Farm Animals (Dept. Agric.), 1891; Diseases of the Horse (Bur. An. Ind.), 1890; 9th Annual Report of U. S. Geol. Survey; Report of Secretary of War, Pts. 1 and 2, 1889-90.

R. Friedlander & Sohn, Berlin : Catalogue No. 393, Zoologie, 1891.

Board of Elections: Registered Voters of Cincinnati, 1890.

United States State Department: Report International American Conference, 1890.

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D. C. Bellville: *Horned Toad*.

Geo. L. Talley: *Stag Beetle*.

Frank Lukens: *Samia cecropia*.

REPORT OF TREASURER, CINCINNATI SOCIETY OF
NATURAL HISTORY, FOR THE YEAR
ENDING APRIL 6, 1891.

Receipts from all sources,	\$9,575 21
Payments,	9,218 06
Balance in Treasury,	<u>\$357 15</u>

RECEIPTS.

Balance,	\$174 48
Dues and Initiations,	1,283 89
Interest,	2,283 80
Five Per Cent Bonds sold,	1,800 00
Six Per Cent Bonds sold,	1,200 00
Amount of Building Fund received from Trustees,	1,762 54
Life Memberships,	950 00
Donations to Building Fund,	105 00
Refunder—W. B. Carpenter & Co.,	8 65
Sales of Journal,	6 85
	<u>\$9,575 21</u>

PAYMENTS.

Salaries and Wages,	\$1,665 14
Fuel, etc.,	74 30
Treasurer's expenses,	5 94
*Printing, etc.,	285 19
Custodian's Sundries,	194 47
Binding,	15 00
Gas and Water,	39 99
†Insurance, five years on Collection and New Building,	261 00
‡Journal,	727 87
Repairs,	38 70
Museum,	87 40
Dues refunded (paid twice),	9 00
Building,	5,814 06
	<u>\$9,218 06</u>
Balance,	<u>357 15</u>
	<u>\$9,575 21</u>

*This item includes some bills for Sundries.

†Insurance for \$10,000 on Collection and \$3,000 on New Building.

‡Includes item of \$82.18 carried over from previous year.

||For detail of payments, see accompanying paper marked A.

A—PAYMENTS ON ACCOUNT OF BUILDING.

Surveying Lot, A. S. Hobby,	\$15 00
Architect's Plans,	80 00
Architect's Superintendence,	80 00
Henry Behrens, Contractor,	4,671 35
John Story, Plumbing and Gas Fitting,	460 61
Bennett & Peck Heating and Ventilating Co.,	359 60
Electric Fixtures,	127 75
Stained Glass and Sundries,	19 75
	<hr/>
	\$5,814 06

BUILDING FUND.

Derived from the following sources.

Life Memberships,	\$950 00
Building Fund,	1,762 54
Five Per Cent Bonds,	1,800 00
Six Per Cent Bonds,	1,200 00
Donations,	105 00
	<hr/>
	\$5,817 54
Balance,	3 48

During the year just ended the collection of dues and initiations has been in the hands of the Secretary, who has made returns of amounts collected from time to time.

A greater part of the bills paid have been by order drawn on the Treasurer, by the Secretary, and countersigned by the President. The exception to this rule was made by special resolution of the Executive Board, authorizing the Treasurer to pay gas and water bills, and salaries as they became due, without any special action of the Board. The Executive Board also authorized the Treasurer to make payments on account of the building to the contractor on certificate of the architect.

The vouchers accompanying this report, therefore, consist of: Orders drawn by Secretary, gas and water bills, receipts for salaries and wages, architect's certificates.

A complete list of vouchers will be prepared and submitted with the vouchers to the Auditing Committee.

The Treasurer takes pleasure in reporting that the interest on the Endowment Funds of the Society has been fully and in most cases promptly paid.

It is not inappropriate in this report to allude to the long services of my predecessor in office, who has so lately passed to his long reward. The value of the service performed for the Society by Mr. S. E. Wright, during the many years of his term as Treasurer, can hardly be realized by those unfamiliar with the details of his work. The care with which the accounts were kept scarcely appears in his reports, complete and systematic as they are. The duties incident to the office are much lessened by the present system of collecting dues and paying bills. To the former duty, during Mr. Wright's term, was added the care of the Endowment Fund.

Mr. Wright's system of accounts has simplified greatly the work of the present Treasurer, and he wishes to record his obligation to him; and also to add his tribute to the memory of a firm and true friend of the Cincinnati Society of Natural History.

All of which is respectfully submitted,

DAVIS L. JAMES,
Treasurer.

The undersigned committee, to whom has been referred the Report of the Treasurer of the Society of Natural History for the year ending April 6, 1891, beg leave to report that they have carefully examined the books and vouchers exhibited to them by the Treasurer in connection with said report, and find the report in all respects correct and true.

Very respectfully submitted,

GEORGE BULLOCK,
T. B. COLLIER,
T. H. KELLEY,

Cincinnati, May 18, 1891.

Committee.

REPORT OF THE SECRETARY.

CINCINNATI, O., APRIL 7, 1891.

TO THE PRESIDENT AND MEMBERS OF THE CINCINNATI
SOCIETY OF NATURAL HISTORY:

In accordance with the requirements of the Constitution I have the honor to submit the following report:

During the past year there have been held nine regular and one informal meetings—there being no quorum present at the July, August or March meetings, owing to unfavorable weather. The average attendance at meetings was thirty.

There were read in full, by abstract or by title, eighteen papers on scientific subjects, some of which have been published in our "JOURNAL."

During the past year there have been elected forty-six active members, one honorary and one corresponding member, and fourteen active members have resigned. Three active members, one life member and one honorary member have died. Twenty members have taken life memberships.

We have, at present, nearly three hundred members.

During the year I have collected and paid to the Treasurer:

Dues from Active Members,	\$1,205 00
Dues from Life Members,	1,000 00
From Donations to Building Fund,	100 00
From Subscription and Sale of Journal,	6 00
Total,	\$2,311 00

The Tenth Annual Course of Free Popular Scientific Lectures was given in our New Auditorium, with an average attendance of two hundred persons. The entire expense of the course was but \$30 50. The lecturers were Prof. J. G. Porter, Dr. F. W. Langdon, Prof. C. L. Herrick, Prof. Karl Langenbeck, Dr. Jno. E. Baker, Mr. Chas. Dury, Dr. David S. Jordan, Dr. Joseph Ransohoff and Dr. J. A. Henshall, all of whom gave their services gratuitously.

During the year I have issued Certificates of Membership to all members in good standing.

I have had the Society's building placed upon the free-water list by the Board of Public Affairs.

The correspondence of the Society during the year has been quite extensive, and our standing as a scientific institution is paramount to any other west of the Alleghany Mountains.

We have added a new addition 30x60 feet, and three stories in height, furnishing an Auditorium, a Library, rooms for the Photographic Section, and a Museum room nearly 30x60 feet, lighted by sky-lights.

Respectfully,
J. A. HENSHALL, *Secretary.*

REPORT OF LIBRARIAN.

TO THE CINCINNATI SOCIETY OF NATURAL HISTORY:

The plans for the enlargement of the Society's building during the past year embraced special accommodations for the library, which is now located in a well-lighted room, on the second floor, and jointly occupied as a reading-room by the Photographic Section.

In this room our volumes are arranged on the shelves of ten large book-cases, each provided with glazed double doors. In addition to these there are three similar cases in the Secretary's room, on the first floor. The latter are occupied principally by unbound pamphlets, exchanges and the latest reports.

Our library, at the present date, consists of 2,409 bound volumes and about 1,800 pamphlets and exchanges. The bound volumes comprise valuable works of reference in general science, comprehensive reports of National and State surveys, and monographs and elaborate treatises on special subjects.

The following departments of science are fairly well represented, namely: Geology, including paleontology and mineralogy; chemistry, physics and microscopy; botany and forestry; zoology, including conchology, ichthyology, entomology and ornithology; anthropology, ethnography and archæology.

The quarterly JOURNAL, published by our Society, containing, as it does, a report of the Society's proceedings, and the most important scientific papers contributed by its members, is highly appreciated by scientists in both hemispheres, and secures for us a large and valuable exchange list. These exchanges number one hundred and sixty-eight, of which eighty, or nearly one-half, are American, and the remainder come from scientific associations in Europe, Asia, Africa, Australia and South America.

It has been the custom of our Society to bind from forty to fifty volumes of exchanges and pamphlets each year, but, owing to a diversion of the Society's funds to building purposes during the past year, no additional volumes have been bound, and there is a considerable accumulation of very im-

portant scientific material that is not in a convenient, and scarcely in an accessible, shape for reference.

As these latest exchanges and pamphlets bring the researches of science quite down to date, they are of great importance to scientific students and the working members of our Society, and at least one hundred volumes should be bound and made accessible to use at once.

Though we have quite a respectable library, as compared with many other scientific associations in this country, yet we occupy a very modest place beside some of the older organizations in the East. I may cite two or three of them, by way of comparison:

The Franklin Institute, located in Philadelphia, has 35,015 bound volumes and 20,972 pamphlets.

The Academy of Natural Sciences, of Philadelphia, has 30,831 bound volumes and 8,621 pamphlets.

The Essex Institute, in Salem, Mass., has about 50,000 bound volumes and upwards of 100,000 pamphlets.

It will thus be seen that our library is comparatively small, and we shall gladly welcome additions of scientific works from whatever source, and thankfully acknowledge the donations.

In conclusion, I desire to call the attention of those intelligent members of our Society, who have no special scientific aims or tastes, to the large amount of really interesting material stowed away, in one form or another, upon the shelves of our library.

There are spirited sketches and artistic views, in well-written and finely illustrated explorations and surveys, and there are graphic descriptions of curious animal, vegetable and mineral forms to be found in odd nooks and corners of the earth, and there are presentations of some branches of natural science in a style so attractive as to have the fascination of romance.

It will pay you well to search out some of these precious gems, partially buried in the dry and forbidding technicalities of science, and read the thrilling story of nature, as told by such masters as Herschel, Lyell and Tyndall, Darwin, Wallace and Huxley, Humboldt and Helmholtz, Arago and Flammarion, Agassiz, Gray and Newcomb, and the host of other brilliant writers on various branches of natural science.

WM. H. KNIGHT, *Librarian.*

REPORT OF DIRECTOR OF MUSEUM.

CINCINNATI, April 7, 1891.

TO THE PRESIDENT AND MEMBERS OF THE CINCINNATI
SOCIETY OF NATURAL HISTORY:

As Director of the Museum, I have the honor to report as follows:

Immediately after the last Annual Meeting the collections from the old rear building were moved into the main building, preparatory to re-building that portion. I was forced to place these additional collections wherever room could be found for them, without any attempt at orderly arrangement, as the main building was greatly over-crowded before. During the building operations the Museum was closed to the public, for ostensible reasons.

The Museum still remains in a crowded and chaotic state, as nothing can be done in the direction of an orderly arrangement or classification until new cases are provided for the new room in the third story of the addition. This, it is hoped, we will soon be able to accomplish, when our valuable collections can be properly, orderly and scientifically displayed.

During the year we have had donated to the Society the large and valuable collection known as the Paul Mohr Collection, and estimated to be worth \$10,000, containing, as it does, some 20,000 specimens of fossils, minerals and pre-historic relics. It is one of the finest representative collections in the country.

The following are the names of the donors:

J. G. Schmidlapp, Julius Dexter, Alex. McDonald, Jas. Levy & Bro., Chas. H. Kellogg, Jr., Christ. Moerlein, Chas. Fleishmann, Charles Hofer, Thos. Sherlock, Herman Goepper & Co., Thos. T. Gaff, Dr. W. W. Seeley, Albert Schwill & Co., Edw. Senior, Robt. Clarke, Mrs. C. L. Anderson, Windisch, Muhlhauser Co., Albert Erkenbrecker, E. F. Bliss, Maddux, Hobart & Co., Jno. Kauffman Brewing Co., Gambrinus Stock Co., C. F. Lunkenheimer, Mrs. Bellamy Storer, Cin. Volksblatt Co., Mrs. Chas. Schmidlapp, James Walsh & Co., J. Ralston Skinner, Robt. Mitchell, Jos. S. Peebles & Co., O. J. Wilson, T. H. Aldrich, Robt. Meier, Julius Frieburg, J. L. Workum, M. Werk, J. A. Henshall.

We have also received during the year, among other donations, a large collection of Marine Invertebrates, from the United States Fish Commission, at my personal solicitation; also from the same source a collection of Florida fishes, being a portion of a collection made by me in the Winter of 1888-89. (These are not yet unpacked).

I have also added ten new species of Ohio fishes, so that our collection of Ohio fish fauna is now nearly complete, there being but about twenty more known species to procure, having altogether one hundred and thirty species.

The collections of birds has been added to by Mr. E. O. Hurd, and the mammals by Mr. Chas. Dury.

Prof. G. Brown Goode, Director of the United States National Museum and Assistant Secretary Smithsonian Institution, visited our rooms twice during the last few months, and stated that he considered our Society the center of scientific interest west of the mountains, and as having, by far, the best Museum. In a recent letter to me he says: "The constant activity of your Society, and the amount of work which it is accomplishing, is quite sufficient to justify the construction of another building, when the scope of its energies and the work which it will be in a position to accomplish, will doubtless be very greatly extended."

We hope in the near future to secure a site in Eden Park, removed from the smoke and soot of the city, and to erect a fire-proof building for our Museum. Our present building should always be retained for offices, the Library, for lectures and meetings, and for the Photographic Section.

Respectfully,

J. A. HENSHALL,

Director.

REPORT OF CURATOR OF PHOTOGRAPHY.

CINCINNATI, April 7, 1891.

MR. PRESIDENT, LADIES AND GENTLEMEN:

On behalf of the members of the Photographic Section of this Society, I have the honor and pleasure of reporting that this section is in a very prosperous condition. Our member-

ship has increased in the last year from 127 to 150. We have lost no members by death, and but fifteen by resignation.

Our annual excursion, given on Decoration Day, May 30th, of last year, was attended by about 100 members of this section, and was greatly enjoyed, both socially and photographically, and proved a financial success.

The exhibition of lantern slides, which has been given annually by this section, was given this year by a few members in their individual capacity, so there could be no question raised as to whether there was a violation of the constitution of the Society, in charging an admission fee, although such charge was made solely to raise a fund for the purpose of defraying part of the expense incurred by this section in fitting up their quarters. This meeting was very largely attended, although the weather was most inclement, and was very gratifying to the members, as showing, beyond doubt, that there was no lack of interest by the public in the work of the members.

In the same line with this, is the series of lectures now in progress, one of which was given in this building a week ago last Thursday evening, to be followed on next Thursday evening by another, and again in two weeks from that date by the final lecture.

Our equipment, which a year ago was very incomplete and in a primitive condition, so far as apparatus for practicing photography was concerned, has been replaced with new and modern appliances; four dark-rooms added, which, with our studio, reception and reading-rooms, are the equal of those owned by any society in this country. All this has been done without any assistance from the Society at large, except for those additions which form a part of the permanent addition to the Society building. Such furniture as the chandeliers in both the reception and reading-rooms, the carpets, curtains and photographic apparatus of all kinds, including the gas fixtures in the auditorium, have been paid for by members of this section alone. In addition thereto, this section has furnished the auditorium with 200 very handsome and comfortable chairs, and has assumed the payment for same. This latter is not really a debt which should have been incurred by the section, for it benefits the Society at large quite as much,

if not more, than it does the section, and the payment of same was assumed by the section in the hope and with the belief that the Society would appreciate the efforts which the section was making to render the auditorium attractive and comfortable, by responding liberally to the invitations to attend the series of lectures which the section has prepared for the express purpose of raising a fund to pay for the refurnishing of the auditorium. In this, I regret to say, the section has been disappointed, as very few of the members of the Society of Natural History, outside of the members of the Photographic Section and its friends, have responded to the invitations sent out. Further than this, and in the matter of raising money to pay for the additions and improvements made on this building during the past year, the Photographic Section has responded very nobly. No less than nineteen of its members have taken life memberships in the Society, and have either taken for themselves, or by personal solicitation have induced their friends, who otherwise would not have done so, to purchase notes issued by this Society in the sum of \$2,100.

Mention of these facts is made, Mr. President, not for the purpose of lauding the action of the members of this section, but to correct an impression which, I am informed, exists in the minds of certain members of the Society, who are not members of this section, that this section is not in accord with the Society, but is a drag upon the Society. This, I am sure, is a misconception. This section is as loyal to the Society as any of its other branches are, and has evidenced its loyalty by causing to be paid into the treasury of the Society, either by its members, or through their individual friends, including their annual dues, the sum of \$3,700. This is more than any other section of this Society has done, and as much, I believe, as all the other sections put together have done.

Very respectfully submitted,

T. B. COLLIER.

TRUSTEES' REPORT.

CINCINNATI, OHIO, April 27th, 1891.

TO THE BOARD OF DIRECTORS OF THE CINCINNATI SOCIETY OF NATURAL HISTORY:

Gentlemen—Absence from the city prevented the presentation of your Trustees' report at the last annual meeting of the Society. Accordingly, that report for the Trustees, to date, is herewith transmitted.

The securities, notes and bonds, in possession of the Trustees, are described as follows:

MORTGAGES SECURED BY REAL ESTATE.

FROM	Date	Time	Interest	Par Value
Martin Byrnes,	April 22, 1887,	1 year, 6	per cent,	\$4,000
W. S. Baker and Wife, . .	May 9, 1888,	3 years, 7	"	1,500
Caroline Blymyer et al, .	Nov. 23, 1887,	2 " 6½	"	8,000
Anthony Costello, . . .	Sept. 19, 1887,	3 " 6	"	1,000
Mary S. Orange,	Dec. 23, 1880,	3 " 6	"	2,000
Richard Oliver,	Aug. 18, 1887,	3 " 6	"	3,000
John A. Bigelow,	Aug. 31, 1889,	2 " 6	"	1,000
William M. Este,	Oct. 14, 1889,	1 year, 6	"	4,000
Joseph M. Story,	Nov. 30, 1889,	3 years, 6	"	1,000
William M. Este,	Nov. 25, 1889,	2 " 6	"	8,500
Margaret A. Shields, . .	Dec. 3, 1889,	3 " 6	"	4,000
Total,				\$38,000

BONDS AND OTHER SECURITIES.

Cincinnati Southern Railway Bonds, 7½ per cent,	\$2,000
Note of A. A. Ferris, dated July 26th, 1890, payable on demand, interest 6 per cent, (held by Davis L. James, Treasurer), amount,	600
One Cincinnati Deficiency Bond, 4 per cent,	500
" " " " 4 "	100
Total Bonds, etc.,	\$3,200

RECAPITULATION.

Mortgage Securities,	\$38,000
Bonds and other securities.	3,200
Total funds on hand (face value),	\$41,200

It will be observed that there has been no change in the mortgage securities since the report of a year ago. Some of these mortgages are past due, but, following the rule in vogue for a number of years, we allow mortgages to run after due, where the security remains unimpaired, and the interest is paid promptly. These requirements have been complied with, and therefore the mortgages remain the same.

In June of last year the Treasurer of the Society made demand upon the Trustees for what is known as the Building Fund. From inquiry of the former Treasurer and examination, it was found the funds in the hands of the Trustees included a specified fund or sum of money which had been known as the Building Fund, and was not properly a part of the general funds of the Society. This had been included in the general fund, and had been invested with the other funds of the Society, and was, therefore, entitled to interest. This Building Fund, upon calculation of interest, amounted, on June 23d, 1890, to the sum of \$1,762.54. To provide this fund, it was necessary to convert some of the Society's securities into money. The Trustees accordingly disposed of the U. S. 4 per cent bonds, par value, \$2,000, at $122\frac{1}{4}$, altogether amounting to \$2,445. Out of this sum the Trustees paid over to the Treasurer, Mr. James, the amount of the Building Fund, as above stated. This left several hundred dollars on hand for investment.

Mr. Ferris, one of the Trustees, said to Mr. James, that he could use \$600, and would pay interest on the amount; and accordingly he gave a note for that amount, payable on demand, which is in the hands of Mr. James, the Treasurer.

The note of Miss Emily Orange for \$540, appearing in our report of a year ago, has been recently paid, and the proceeds of that note and the other surplus money on hand have been invested in the Deficiency Bonds, above noted.

The bond for \$500 was purchased at $102\frac{1}{4}$, and the \$100-bond was purchased at $105\frac{3}{4}$.

The Trustees will exhibit their accounts and securities to the Board, or a committee that may be appointed, at any time agreeable to the wishes of the Board.

Respectfully submitted,

AARON A. FERRIS, }
W. P. ANDERSON, } *Trustees.*

The undersigned committee, appointed to audit the foregoing report of the Trustees of the Society's funds, beg leave to report that they have examined the securities in the hands of said Trustees, and find that they have been accurately described and listed, and that the said report is, in all respects, a correct statement of the financial condition of the Society.

Very respectfully submitted,

GEORGE BULLOCK,

T. B. COLLIER,

T. H. KELLEY,

CINCINNATI, May 18, 1891.

Committee.

ON THE AGE OF THE PT. PLEASANT, OHIO, BEDS.*

BY PROF. JOSEPH F. JAMES, M. Sc., F. G. S. A.

(Ass't Geologist, U. S. Geological Survey.)

The rocky strata in the vicinity of Cincinnati have been observed and studied for many years and by many persons. It is probable that even the very early settlers noticed the rocks exposed in the hills, and used them for the foundations of their houses. The hill slopes could not have presented the same aspect they now have, for the easily disintegrated rock and shale must have formed a regular slope with few, if any, rocky ledges projecting. The streams between the hills probably exposed the character of the formation; and it could not have been many years before the main features of the strata were shown. Not only were practical men attracted to the rocks, but as time passed students came from various parts of the world to see and collect the fossils so abundant in the vicinity. The locality now has a world-wide reputation as a spot abounding in wonderfully preserved organic rocks.

A mere list of the authors who have written upon the rocks and fossils of Cincinnati and its vicinity would be a long one. It would include the greater number of the early geologists of our own country, and not a few of those from abroad. As far back as 1815 Dr. Daniel Drake, in his "Picture of Cincinnati," described, in a general way, the characters of the rocks, noting that they were in layers from one to eighteen inches thick, the limestone alternating with clay or slate. He also mentioned various fossil corals and shells that had been found, but gave no definite description of them.

In 1818 the same writer published another paper entitled "Geological Account of the Valley of the Ohio,"† in which he

*Published by permission of the Director of the U. S. Geological Survey.

†*Am. Phil. Soc. Trans., new ser., vol. 2, 1818, pages 124-139.*

describes the limestone as nearly horizontal; and he gives also the details of a section across the river from Cincinnati to Newport, illustrating it by a colored plate.

In 1829 Vanuxem called attention to the resemblance the strata of parts of Ohio, Kentucky and Tennessee bore to rocks occurring at Trenton Falls, New York,* concluding from the fossils that the rocks of the East and of the West were of approximately the same age. This is the first direct correlation made of the strata about Cincinnati with those of New York. But it was not the last, for since that time many others have instituted similar comparisons. A few of these will be here referred to.

In 1841 Conrad mentioned the limestone of Cincinnati as the "equivalent or continuation of the black limestone of Trenton Falls,"† the correlation being based upon the fossil contents of the rocks.

In the following year Hall stated‡ that there was at Newport, Kentucky, opposite Cincinnati, a green shale occupying the same position, and containing the same fossils as the Utica Shale of New York; saying also that the rock below it, "which is seen in place only during low water in the Ohio," is probably the equivalent of the Trenton limestone of New York. This correlation is made upon stratigraphical position.

Previous to this, and to Conrad's correlation mentioned above, Prof. John Locke|| had given an admirable description of the blue limestone of southwestern Ohio, stating that it was found as far south as Lexington, Kentucky, but that at Frankfort, the Cliff limestone was found. The latter is now known to be of Trenton and not of Niagara age, as Dr. Locke supposed. No comparison was made by him with rocks in the eastern States.

In 1843 Hall published a paper§ in which he examined the structure of the rocks along a line from Cleveland to the Mississippi River, in the course of which he referred to the strata in the vicinity of Cincinnati, and other localities in Ohio and

*Am. Jour. Sci., vol. 16, 1829, page 256.

†Fifth Annual Report Geol. Sur. of New York, 1841, page 27.

‡Am. Jour. Sci., vol. 42, 1842, page 61

||Second Ann. Rept. Geol. Sur. Ohio, 1838, page 207.

§Trans. Am. Asso. Geol. and Nat., 1843, pages 267-293.

Kentucky. A study of the rocks at Maysville, and of the fossils contained therein, led him to refer them to the Hudson River Group of New York. He said that neither the character of the rocks nor the fossils indicate the Trenton Group. He described a section as seen at Cincinnati, and concluded upon the evidence of *Triarthrus beckii* and fossils in the overlying rocks, that the Utica slate was represented; and that although a lower rock was exposed, it might or might not be the Trenton. He then describes the overlying series forming the main mass at Cincinnati, concluding that they represent the Hudson River Group. The remains of *Isotelus* (*Asaphus*) had usually been considered sufficient proof of the identity of the Cincinnati rocks with those of Trenton age in New York, but Hall said that all the specimens he had seen were different from Trenton forms. "So that," he continues, "although certain species of the genus do occur in the Trenton limestone and are characteristic of that formation, others are not necessarily so, and unless we take wide ranges in our groupings, we can not depend on generic types. In this case the amount of evidence seems to be about equally divided between the Trenton and Hudson River Groups; but since there are fossils decidedly typical of the latter, and we know that in New York they never occur in a lower position, we are compelled to admit that this formation is of the same geological age."*

In all the subsequent publications of Prof. Hall, this term has been applied to the rocks of this age in the Mississippi Valley. He has been followed by most of the writers who have referred to the rocks up to the year 1865. In this year Meek and Worthen proposed† the name "Cincinnati Group" to cover the strata of Ohio and other western States, previously referred to the "Hudson River Group." The term "Cincinnati Group" has, since its proposal, been generally used, especially by western geologists, as they recognized it as a convenient and applicable term. Its employment has, however, always been resisted by Hall and some others, who continue to use Hudson River and Utica Shale. We are not now concerned with the application of any special term, being

*Ibid., page 276.

†Phil. Acad. Nat. Sci. Proc., vol. 17, 1865, page 155.

inclined to accept Mr. C. D. Walcott's suggestion to refer to these rocks as the Cincinnati shale and limestone in the Hudson Terrane.*

Upon the organization of the Second Geological Survey of Ohio, under Dr. J. S. Newberry, special attention was naturally directed to the rocks in the vicinity of Cincinnati, and in the first volume of the final report,† Prof. Edw. Orton proposed to divide the rocks into three series as follows:

Lebanon Beds,	293 feet.
Cincinnati Beds, proper,	425 "
Point Pleasant Beds,	50 "
Total,	768 feet.

The Cincinnati Beds are again divided into the—

Hill Quarry Beds,	125 feet.
Eden Shales,	250 "
River Quarry Beds,	50 "
Total,	425 feet.

Details are given of these different series, together with an account of the fossils obtained from various strata.

It is to the lowest division of the Cincinnati rocks, called by Prof. Orton the Point Pleasant Beds that particular attention is directed at the present time. This series is stated to contain the lowest rocks of the State, and it takes its name from the exposure at Point Pleasant, a little settlement on the Ohio, some twenty-five miles above Cincinnati. The beds of the series begin at low water mark at Cincinnati, and descend gradually toward the east as far as Point Pleasant, when they rise again. At this point the strata are about fifty feet in thickness, below the lowest level of the Cincinnati rocks. They have been described by Prof. Orton as being lighter in color than the upper courses, and to be sometimes slaty in structure, "while in others they have a tendency to assume lenticular forms of concretionary origin, sometimes to such an extent as to destroy their value as building rock. The layers

*Value of the term Hudson River Group in Geologic Nomenclature. Bull. Geol. Soc. of Am., vol. 1, 1899, page 353.

†Geology, vol. 1, 1873, page 373.

are also exceptionally heavy, attaining a thickness of sixteen or eighteen inches, and are often so free from fossils as to afford no indication of the kinds of life from which they were derived.”* It was this series that was subsequently referred to the Trenton horizon by S. A. Miller, of Cincinnati, and Prof. Orton, the State Geologist of Ohio; and it was also visited and studied by the writer of this last year, under the auspices of the United States Geological Survey. It will be interesting to refer still further to the literature before detailing the results of my own examination.

The first volume of the Geology of Ohio, cited above, was severely criticised by Mr. S. A. Miller, in a paper read before the Cincinnati Society of Natural History in August, and published in the *Cincinnati Enquirer* of August 7, 1873. The author states that he had examined the rocks at Point Pleasant, and all the exposures on the river as far as Cincinnati; and that there were neither lithological nor paleontological characters to distinguish this series from that exposed at Cincinnati. He advocated discarding Prof. Orton's designation, considering it “wholly unwarranted,” and a “drag upon the science.” He thought the rocks represented a lower horizon than those of Cincinnati, but did not consider them any more worthy of a special name than “every exposure at each separate hill throughout the blue limestone region.” He also criticised the division into *River Quarry Beds*, *Eden Shales* and *Hill Quarry Beds*, believing there were no facts to warrant any such division. Throughout the article, neither the names Hudson River nor Trenton, as applied to any of the Ohio rocks, appear.

This opinion was materially modified about six years later in a report of a committee of which Mr. Miller was Chairman.†

The committee was appointed to report upon some system of nomenclature for the Cincinnati rocks, and they referred the strata to the Utica and Hudson River Groups, stating also that probably the Trenton is represented in the banks of the Ohio River, “a few miles east of the city.” This refers doubtless to the rocks at Point Pleasant. It is a return to the

*Ibid, pages 373-374.

†*Jour. Cin. Soc. Nat. Hist.*, vol. 1, 1879, pages 193-194.

opinion expressed by Prof. Hall in 1842.* This report has been quite extensively quoted, and it has been erroneously considered to represent the views of the majority of the Cincinnati geologists. It was criticised by Mr. U. P. James in 1879,† who, after giving the evidence adduced in favor of referring the rocks to the Hudson River and the Utica Slate, says that if the name "Cincinnati" be dropped, "it would seem more appropriate to take the Trenton Group, *not* Utica Slate, nor Hudson River; the proportion of Trenton fossils in the Cincinnati being more than *two to one* of the Utica Slate or Hudson River." He was not, however, in favor of using Trenton, but of retaining the term Cincinnati, basing his argument on the fact that only about one hundred out of the five hundred species known from the Cincinnati Rocks, are identical with species from either the Trenton, Utica or Hudson rocks of New York; and out of the one hundred, sixty-five are confined to the Trenton, eighteen to the Utica and Hudson, and the remainder are common to all three groups.

In 1882 Mr. W. M. Linney,‡ of the Kentucky Geological Survey, said that the building stone quarried at Point Pleasant, Ohio, was doubtless the same as the gray limestone forming the upper part of the Trenton of New York.

In 1882 Prof. Edw. Orton|| changed his reference of the Point Pleasant Beds from the Cincinnati Group to the Trenton, thus following Miller. The reference was made from the fact that the Utica Shale was found to be three hundred feet thick at Findlay, Ohio, and contained the characteristic fossil, *Leptobolus lepis*; and this shale having disappeared from the lower part of the State, the Hudson rocks must rest directly upon the Trenton Group, which thus became exposed at Point Pleasant. But this fact does not agree with the statement‡ on page 300 of the same volume, that the Hudson River

*It is noteworthy that of the members of the committee reporting thus, two of the five, who have since written upon the subject, have returned to the use of the term "Cincinnati Group;" and this, too, within a year after the adoption of the report. These two are A. G. Wetherby and E. O. Ulrich. Messrs. Miller, Dyer and Mickleborough still adhere to Hudson River and Utica Slate. As far as known to the writer, the other five have not published any papers dealing with the subject.

‡The Paleontologist, No. 4, pages 27-28.

‡Notes on rocks of Central Kentucky, 1882, page 6.

||Geol. Sur. of Ohio, vol 6, 1888, page 5.

Group is one hundred and twenty-four feet, and the Utica shale one hundred and thirty-five feet thick at Cincinnati, below which comes the Trenton limestone. This statement is based upon the record of a well bored at Cincinnati. Now, the mouth of this well was only about seventy feet above low water in the Ohio River; of this seventy feet, forty-eight were drift materials, leaving twenty-two feet of rock down to low water. Deducting this from the thickness assigned to the Hudson River Rocks we find it extending one hundred feet below low water in the Ohio; and if to this we add the one hundred and thirty-five feet assigned to the Utica Shale, we have two hundred and thirty-five feet of rock below low water in the Ohio, at Cincinnati, before the Trenton limestone is touched. How, then, is it possible upon this evidence to assign the beds at Point Pleasant, only fifty feet lower than the lowest rocks at Cincinnati, to the Trenton terrane? In a second well, it is estimated that the Trenton was reached at a depth of about two hundred and fifty feet below low water in the Ohio River.

In the same year, 1888, Mr. E. O. Ulrich, in an article entitled "A Correlation of the Lower Silurian Horizons of Tennessee, and of the Ohio and Mississippi Valleys, with those of New York and Canada,"* mentions the Point Pleasant Beds and assigns them to the lower part of the Cincinnati rocks. On another page of the article,† he correlates the beds with rocks occurring at Lexington, Kentucky.

In 1889 Prof. Orton, in the course of a paper on "The Trenton Limestone as a Source of Petroleum and Natural Gas in Ohio and Indiana,"‡ again refers to the Point Pleasant Beds as of Trenton age. He says this reference was made in 1873 by some geologists, among them Mr. S. A. Miller, citing the JOURNAL OF THE CINCINNATI SOCIETY OF NATURAL HISTORY. This date is an obvious error for 1879, because the first volume of the JOURNAL was not issued until 1878-1879, and in January, 1879, the report of the committee already alluded to was published. No special description of the strata is given, but mention is made of the composition of the limestone, and it is compared with the Trenton of other localities.||

*American Geologist, vol. 1, 1888, page 307.

†Ibid, page 181.

‡Eighth Ann. Rept. U. S. Geol. Sur., part 2, 1889, page 546.

||Ibid, pages 550-552.

In 1890 the same reference is again made by Prof. Orton,* but no details beyond those already mentioned are given.

The references above given comprise some of those that have been made to the rocks of Cincinnati, and they are all, we believe, that have considered the Trenton to occur in outcrop in Ohio. In order to study the section at Point Pleasant, I visited it last year (1890) and secured the data given below. A careful study of the fossils collected, and of other localities in the neighborhood, will add something to the account here given, but it is not believed the conclusions will be materially modified. The section studied is in the bed of a small stream that heads near the top of the hill. It is situated about half a mile below the village of Point Pleasant, and two openings have been made in the hill near the wagon road, about fifty feet from the water's edge.

SECTION AT POINT PLEASANT, OHIO.

	Feet. In.
Hill slope (covered)	— —
Limestone, with a few thin bands of shale,	40 —
Shale, with occasional thin layers of limestone,	37 —

Trinuclens concentricus was found in a limestone layer overlying a layer containing mud cracks.

Limestone, with occasional beds of shale,	30 4
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There are two very decidedly waved layers in this distance of 30 feet 4 inches. One is near the top and the other near the bottom. In the latter, the distance from crest to crest of the waves was 4 feet 6 inches. This layer was largely made up of crinoid stems.

— Heavy bed of limestone,	2 —
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This course is remarkable for its compactness, thickness and extent. It contains many fossils, such as branching species of *Monticulipora*, *Strophomena*, etc. It is plainly visible about midway in the quarry opening on either side of the ravine, and it is a marked feature in the quarries along the road between New Richmond and Point Pleasant. In one of these quarries a great mass had fallen down, more or less concretionary

*First Ann. Report Geol. Sur. Ohio (third organization), 1890, page 12.

in its structure, portions peeled off having a conchoidal fracture. The fossils observed in the ravine were also visible in this large mass.

Covered,	6	4
Limestone and shale,	5	8

A heavy layer of limestone about 8 inches thick occurs about a foot from the top, underlain by a foot of shale. The rest is limestone in broken courses.

Limestone and shale,	5	8
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This interval contains waved limestone layers and 4 beds of shale, 10 inches, 8 inches, 10 inches and 6 inches thick respectively. The limestone contains quantities of corals, brachiopods, and fragments of *Asaphus*. In one of the layers, *Strophomena alternata*, *Monticulipora mamillata* and stems of *Glyptocrinus* occur. Fig. 1, pl. 3, shows the character of the strata in this section.

Limestone and shale,	5	8
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In this series the limestone is in broken courses of varying thickness, and with a few thin seams of shale. It forms a series of steps in the stream bed. On the bank, about midway, is a large slab of rock 1 foot 8 inches thick, 3 feet 10 inches wide and 4 feet 10 inches long, upon the surface of which were specimens of *Strophomena alternata*, *Orthoceras* with septa $\frac{1}{4}$ of an inch wide, *Orthis*, *Zygospira* and a *Murchisonia* like *M. gracilis*. Fig. 2, pl. 3, shows the character of the section, with the large slab of rock on the bank at the right.

Limestone and shale,	1	6
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The limestone is in thin courses, and more or less waved. The shale lies between broken courses below and a heavy waved course above, formed of finely comminuted material. The top forms the approximate bottom of the quarry opening on the eastern side of the ravine.

Limestone,	1	6
Concealed,	20	—

It is impossible to give the character of this portion

of the section, as it is covered by heavy stone set on end to form a culvert under the road. About 6 feet from the top, however, a heavy waved layer of limestone was seen. From about this point down are the 50 feet which have been called the Point Pleasant Beds, or the Trenton of some authors. In the beds of other ravines, in one in particular about a mile to the westward, is an extensive bed of shale, not slaty, however, and apparently destitute of organic remains. This, in fact, is the case with all the shale beds of the region. While the limestone layers are generally full of fossils, the shale beds are barren. Above this point limestone predominates; below it the limestones and shales are in about equal proportions.

Shale and limestone, 11 4

This interval is also largely concealed, being covered by debris brought by the stream from above or washed out of the banks on either side. The shale alternates with the limestone in courses. The slabs in the stream bed are covered with fragments of brachiopods, crinoid stems, etc. Corals are also abundant, particularly in the upper portion. *Asaphus*, *Strophomena*, various forms of Gasteropoda and *Orthoceras* also occur. One layer of limestone 2 feet 3 inches thick, lies in three courses, and is largely made up of finely comminuted fossils.

Limestone and shale, the former with a few obscure and irregular "fucoidal" markings, 1 3

Limestone, compact and unlike most of the layers in being unfossiliferous; it breaks across the bedding into oblong, rectangular blocks shaped like scythe stones, but on an enlarged scale, — 2

Yellow shale, 1 2

Limestone, forming a waved layer above, and separated from an uneven lower course by yellow shale. The upper layer is formed of fragments of crinoids, brachiopods, etc., 1 9

Blue and yellow shale, 1 4

This contains a thin layer of limestone, with species of *Orthis*, *Asaphus*, *Calymene*, *Leptæna sericea*, etc., mostly (except the last) in a fragmentary condition.

Age of the Pt. Pleasant Beds.

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	Feet.	In.
Limestone, more or less waved and formed of fragments of Brachiopoda, <i>Asaphus</i> , <i>Monticulipora</i> , etc. These last are all branching or parasitic,	—	6
Yellow shale,	—	6
Limestone,	—	2
Blue shale,	—	7
Limestone and shale,	1	4

The shale is largely covered by debris, but the limestone is well exposed, and is markedly waved, the distance between crest and crest of the undulations being 3 feet 6 inches, and the depth of the hollow about 6 in. The rock is formed of finely comminuted fragments of crinoids, *Asaphus*, *Orthis*, etc., and contains specimens of *Strophomena* and *Ptilodictya falciformis* (?)

Limestone and shale, the former seamed and broken,	—	6
Limestone and shale,	1	—

The shale has nodules in it containing specimens of *Orthis testudinaria* or *O. jugosa*. The limestone is made up of countless fragments of crinoid stems, and with what appear to be basis of crinoids or of species of *Ptilodictya*. *Monticulipora*, *Orthoceras*, *Asaphus*, etc., also occur.

Limestone, very uneven in its bedding,	—	4
Shale,	—	3
Limestone, in a compact layer, underlain by a seam of blue shale,	—	2
Covered,	11	6
Total,	189	6

Section cut off by river.

The lower portion of the section below the top of the supposed Point Pleasant Beds has been given in considerable detail, to determine, if possible, whether there were any features of the rocks different from those ordinarily seen in the rocks at the base of the Cincinnati section. None were observed. The section is a continuous succession of shales and limestones, the latter sometimes in heavy, and again in thin, courses. The heavy layers are not specially prevalent in the lowest 50 feet; indeed, the heaviest layer is over 80 feet above the river. There is no break in the deposition, unless it be in the 20 feet now covered, and no marked change in the characters presented.

As far as present information goes, there seems to be no more reason for assigning the Point Pleasant Beds to the Trenton, than there would be in making a similar disposition of the lowest beds at Cincinnati.

During the same season a visit was made to Ludlow, Kentucky, opposite Cincinnati, where the lowest beds of the vicinity are exposed. The water was higher than it had been when Point Pleasant was visited, but from previous knowledge I can say that the rocks exposed even at extreme low water, do not differ materially from those seen on this visit. Nor do they differ from the lower strata at Point Pleasant, except in being more extensively exposed. One section having a vertical height of from 25 to 30 feet was seen in the bed of a small run, and the two views on plate 4 show the character of the exposure from bottom to top. There are alternations of limestone and shale, some of the former being quite heavy, from 8 to 12 inches thick, and conspicuously waved. They are also covered with inorganic or the so-called "fucoidal" markings.

The conclusion is reached, after a study of the Point Pleasant section, and a comparison with the lowest layers as seen on the Ohio at Ludlow, Kentucky, that there are neither lithological, paleontological, nor sedimentary characters, by which to place the two series in two different terranes, unless an arbitrary line be drawn between them; and while there is and can be no question as to the existence of the Trenton limestone beneath a large part of the State of Ohio, there is no good reason to say that it outcrops at the surface in any locality within her borders.

A LIST OF THE BIRDS OF WARREN COUNTY, OHIO.

WITH A SUPPLEMENTARY LIST OF BIRDS OF PROBABLE
OCCURRENCE.

RAYMOND W. SMITH.

(Read by title, January 6, 1891.)

The County of Warren is situated in the south-western part of Ohio. Its southern border is but twenty miles north of Cincinnati, while its western border is about the same distance from the Indiana State line. For all practical purposes of description, it is a square, twenty miles on the side. Across its north-western corner flows the Great Miami, which, with its tributaries, the most important of which are Clear Creek and Shaker Creek, drains the north-western and western part of the county. But the main drainage valley and the county's great artery of bird migration is that of the Little Miami River, which flows directly through it from northeast to southwest, receiving, as comparatively important tributaries, Turtle Creek on the north, Cæsar's Creek on the east, and Todd's Fork on the southeast. The two rivers and the numerous creeks have all cut deep valleys, so that the surface of the country is much diversified.

When first settled, in the latter part of the last century, the entire county was covered by forests, but these have been cleared away, until at the present time cultivated land exceeds by several times the area of woodland. With the clearing of the land has come the drainage, to a large extent, of a great tract of wet, swampy woodland in the western part of the county, the once extensive "Shaker Swamps" being now reduced to a comparatively limited area. All this change must have had an effect upon the avian fauna of the county, but there is no record of it to which to refer.

But another change in the geographical features of the county is of sufficiently recent date to be a matter of both record and memory. Until a few years ago there were two

comparatively large bodies of water in the county, one, the Lebanon Reservoir, originally built as a feeder to the Lebanon and Middletown Canal, situated just north of the town of Lebanon; the other, what was known as Shaker Pond, located about five miles due west of Lebanon. But about eight years ago, during a rainy Summer, both the reservoir and the pond burst their banks. The former was repaired, but broke down its walls again the same year, since which time the county has been without anything in the way of large bodies of water. For a number of years previous to their destruction both were used as the supplies of mill races, and in dry seasons the water, becoming very low, would leave exposed large banks of black alluvium, which attracted great numbers of wading birds. Then again, each Spring and Fall, both the reservoir and pond were the regular stopping places of many varieties of waterfowl. So the destruction of the two little artificial lakes has resulted in the changing of many birds (mainly, however, of those included in the orders *Pygopodes*, *Longipennes*, *Anseres*, *Paludicolæ* and *Limicolæ*) as far as this county is concerned, from regular and common Spring and Fall migrants to rare migrants, and even rare and irregular visitants; and some birds, formerly not uncommon, have since been observed very seldom or not at all.

The following list is very largely the result of personal observation. An important factor, however, has been a handsome collection of mounted birds, prepared by Mr. J. F. Gould, then of this place, now of Cincinnati, in 1879 and the Spring of 1880, all of which were taken in the immediate vicinity of Lebanon. Facts concerning the few birds now extinct in the county, have been furnished by the older residents. But the large portion of the list has been worked out single-handed, and represents the results of odd hours and holidays of several otherwise busy years, and about four months of steady observation and collecting in the Winter and Spring of 1890. It is by no means perfect or complete, as the large list of "Birds of Probable Occurrence" shows for itself; and the above-mentioned rather limited opportunities must serve as an excuse for the omission from the list proper of a number of species which careful observation will certainly demonstrate to occur in the county.

In the following pages the A. O. U. nomenclature has been followed as a standard, and as to the common or vernacular names, the Code is also followed in most cases, the exceptions being birds well-known in the county by the names which appear in the list, rather than those given in the Code. The dates of arrival and departure, which are necessarily approximate, are given so as to include all but the very early or late stragglers.

CLASS AVES.

SUB-ORDER CARINATÆ.—Carinate Birds.

ORDER PYGPODES.—Diving Birds.

FAMILY PODICIPIDÆ.—Grebes.

1. *COLYMBUS AURITIS* Linn.—Horned grebe. Rare Spring and Fall migrant. A pair in the collection of Mr. Gould was shot on the old reservoir in April, 1880.

2. *PODILYMBUS PODICEPS* (Linn.)—Dipper; pied-billed grebe. Regular Spring and Fall migrant, by no means as common now as in the days of the reservoir, on which "dippers" were abundant during the Spring and Fall months, and a few remained during the Summer and probably bred.

FAMILY URINATORIDÆ.—Loons.

3. *URINATOR IMBER* (Gunn.)—Loon. Spring and Fall migrant, now quite rare. At times, however, as many as fifteen and twenty have been seen at once on the Lebanon Reservoir.

ORDER LONGIPENNES.—Long-winged Swimmers.

FAMILY STERCORARIIDÆ.—Jaegers.

4. *STERCORARIUS PARISITICUS*, (Linn.)—Parasitic jaeger. Accidental. As far as I can learn, this is the first record of the occurrence of this bird in the State, or of its appearance so far inland. The single specimen, on which this record is based, was found, while still living, but completely exhausted, in a field near Lebanon, at the close of a week of very stormy weather, in the latter part of March or the early part of April, 1880. Its captor placed it in a cage and offered it corn and

bread, which diet soon completed the work of the storm. The bird was then brought to Mr. Gould and is now in his collection. The description given by Dr. Coues, of this bird, in the state just preceding adult plumage, well describes this Warren County specimen.

FAMILY LARIDÆ.—Gulls and Terns.

5. *LARUS ARGENTATUS SMITHSONIANUS* Coues.—American herring gull. A specimen, in immature plumage, now in Mr. Gould's collection, was taken at the Lebanon Reservoir in the Spring of 1880, and large gulls, almost certainly of this species, were then not uncommon in Spring and Fall. Of late none have been observed, though probably of not infrequent occurrence on the Miamis.

6. *LARUS PHILADELPHIA* (Ord.)—Bonaparte's gull. Formerly occurred regularly, Spring and Fall, on the reservoir, usually after severe storms. Is still a Spring and Fall migrant, though rather irregular, on the Miamis.

7. *STERNA HIRUNDO* Linn.—Common tern. Several specimens, now in Mr. Gould's collection, were taken at the Lebanon Reservoir. None observed of late years.

8. *HYDROCHELIDON NIGRA SURINAMENSIS* (Gmel.)—Black tern. Irregular Spring and Fall migrant on the Miamis. Formerly of quite regular occurrence on the Lebanon Reservoir in the Fall, and not uncommon in the Spring.

ORDER STEGANOPODES.—Totipalmate Swimmers.

FAMILY PHALACROCORACIDÆ.—Cormorants.

9. *PHALACROCORAX DILOPHUS FLORIDANUS* (Aud.)—Florida cormorant. One specimen, a bird in immature plumage, now in Mr. Gould's collection, was taken at the Lebanon Reservoir in the Spring of 1880. Now a rare and irregular migrant on the Miamis.

ORDER ANSERES.—Lamellirostral Swimmers.

FAMILY ANATIDÆ.—Ducks, Geese and Swans.

10. *LOPHODYTES CUCULLATUS* (Linn.)—Hooded merganser. Spring and Fall migrant, not uncommon.

11. *ANAS BOSCHAS* Linn.—Mallard. Regular Spring and Fall migrant, not seen or taken nearly as often since the breaking of the reservoir, although this may be said of any of the species of the order.

12. *ANAS AMERICANA* Gmel.—Widgeon. Spring and Fall migrant. One of the first ducks to arrive in the Spring.

13. *ANAS CAROLINENSIS* Gmel.—Green-winged teal. Common Spring and Fall migrant on the Miamis.

14. *ANAS DISCORS* Linn.—Blue-winged teal. Spring and Fall migrant. In the days of the old reservoir more common than the last species. Now, apparently, the conditions are reversed.

15. *SPATULA CLYPEATA*, (Linn.)—Shoveller; spoonbill. Spring and Fall migrant, tolerably common.

16. *DAFILA ACUTA* (Linn.)—Pintail. Spring and Fall migrant.

17. *AIX SPONSA* (Linn.)—Wood duck. Spring and Fall migrant, and occasional Summer resident. Has been known to breed on the Little Miami, and a pair which spent the Summer of 1879 at the Lebanon Reservoir probably raised a brood.

18. *AYTHYA AMERICANA* (Eyt.)—Red-head. A rare migrant. Specimens have been taken at the Lebanon Reservoir.

19. *AYTHYA AFFINIS* (Eyt.)—Lesser scaup duck. Common Spring and Fall migrant on the Miamis and their tributaries. One of the first ducks to arrive in the Spring and the last to leave in the Fall.

20. *AYTHYA COLLARIS* (Donov.)—Ring-necked duck. Migrant with the last, but quite rare.

21. *CHARITONETTA ALBEOLA* (Linn.)—Butterball. One of the most common Spring and Fall migrants on the Miamis and their tributaries.

22. *ERISMATURA RUBIDA* (Wils.)—Ruddy duck. Formerly of uncommon occurrence on the reservoir and now a rare migrant.

23. *BRANTA CANADENSIS* (Linn.)—Canada goose. A regular Spring and Fall migrant. At any rate, large flocks are seen passing overhead each Spring and Fall, although few of them ever alight. Specimens have been taken, however, on the Miamis and on Turtle Creek.

ORDER HERODIONES.—Herons, Storks, Ibises, Etc.

FAMILY ARDEIDÆ.—Herons, Bitterns, Etc.

24. *BOTAURUS LENTIGNOSUS* (Montag.)—American bittern. A not uncommon Spring and Fall migrant.

25. *ARDEA HERODIAS* Linn.—Great blue heron. Common Spring and Fall migrant and a Summer resident. Breeds. What remains of the old Shaker swamps furnishes these birds a breeding place, and quite a number nest there each year.

26. *ARDEA EGRETTEA* Gmel.—Great white egret. Formerly a tolerably regular visitant, during the later Summer and early Fall, at the Lebanon Reservoir, quite a number of specimens having been taken there; nine in one day, upon one occasion. Now comparatively rare.

27. *ARDEA VIRESCENS* Linn.—Green heron. Common Summer resident, from the middle of April to October. Breeds.

28. *NYCTICORAX NYCTICORAX NÆVIUS* (Bodd.)—Night heron. Rare Spring and Fall migrant. The single specimen in my collection was shot from the top of a tall elm, in the middle of a field, a long distance from any water or swampy ground.

ORDER PALUDICOLÆ.—Cranes, Rails, Coots, Etc.

FAMILY RALLIDÆ.—Rails.

29. *RALLUS ELEGANS* Aud.—King rail. Rare, but regular, Spring and Fall migrant, in April and October; more common in the Spring. Several of these birds have been captured in barns and other out-buildings, in the vicinity of Lebanon, in recent years, which, if not simply coincident accidents, would indicate a peculiar tendency of this species.

30. *RALLUS VIRGINIANUS* Linn.—Virginia rail. Rare Spring and Fall migrant, arriving and departing with the last named species.

31. *PORZANA CAROLINA* (Linn.)—Sora; Carolina rail. Rather common Spring and Fall migrant, in April, May and September.

32. *FULICA AMERICANA* Gmel.—Coot. Formerly a rather common Spring and Fall migrant at the Lebanon Reservoir and Shaker pond. Now, in comparison, rare.

ORDER LIMICOLÆ.—Shore Birds.

FAMILY RECURVIROSTRIDÆ.—Avocets, Stilts, Etc.

33. *RECURVIROSTRA AMERICANA* Gm.—Avocet. Accidental. One specimen, in Winter plumage, taken at the Lebanon Reservoir, in the Spring of 1880, and now in Mr. Gould's collection. With the exception of Dr. Kirtland's rather indefinite note ("This unique bird has been killed by sportsmen in the vicinity of Cincinnati"), this is, as far as I can learn, the second authentic record of its occurrence in the State, Mr. Dury having identified it at Cincinnati some years ago.

FAMILY SCOLOPACIDÆ.—Snipes, Sandpipers, Etc.

34. *PHILOHELA MINOR* (Gmel.)—Woodcock. Not uncommon Spring and Fall migrant and rare Summer resident, from March to November. Breeds.

35. *GALLINAGO DELICATA* (Ord.)—Jack snipe. Migrant in April, May, October and November. In some years very abundant, in others so rare, or apparently so, as to be scarcely observed. More common, as a rule, in the Spring than in the Fall, but sometimes these conditions seem to be reversed.

36. *TRINGA MACULATA* Viell.—Pectoral sandpiper. Migrant in March, April and October; more common in the Spring.

37. *TRINGA MINUTILLA* Viell.—Least sandpiper. Formerly a regular migrant, quite common at the Lebanon Reservoir and Shaker pond, in August and the early Fall. Now rare, but still more common in the Fall than in the Spring.

38. *TRINGA ALPINA PACIFICA* (Coues.)—Dunlin. Very rare migrant. One specimen only, taken at the Lebanon Reservoir in the Fall of 1879, and now in Mr. Gould's collection.

39. *EREUNETES PUSILLUS* (Linn.)—Semipalmated sandpiper. Rare Spring and Fall migrant.

40. *TOTANUS MELANOLEUCUS* (Gmel.)—Great yellowlegs. Rare Spring and Fall migrant. Formerly rather common on the reservoir in August and September.

41. *TOTANUS FLAVIPES* (Gmel.)—Yellowlegs. Formerly abundant in August and September, the time of low water at the old reservoir. Now a not very common migrant in May and September.

42. *TOTANUS SOLITARIUS* (Wils.)—Solitary sandpiper. Common Spring and Fall migrant in April, May, August and September.

43. *SYMPHEMIA SEMIPALMATA* (Gmel.)—Willet. Two specimens, shot out of a flock of about fifteen, at the Lebanon Reservoir, in the Spring of 1880, are now in Mr. Gould's collection. Willets, in such flocks, were not uncommon visitants at the old reservoir in the Spring and Fall, but are now rare.

44. *ACTITIS MACULARIA* (Linn.)—Spotted Sandpiper. A common Summer resident, from April to September. Breeds.

FAMILY CHARADRIIDÆ.—Plovers.

45. *CHARADRIUS DOMINICUS* (Müll.)—Golden plover. Rare Spring and Fall migrant.

46. *ÆGIALITIS VOCIFERA* (Linn.)—Killdeer. A common Summer resident, from March to November. Breeds.

ORDER GALLINÆ.—Gallinaceous Birds.

FAMILY TETRAONIDÆ.—Grouse, Etc.

47. *COLINUS VIRGINIANUS* (Linn.)—Quail. An abundant resident. Breeds.

48. *BONASA UMBELLUS* (Linn.)—Ruffed grouse. Formerly, in the early days of the county, before the timber was cleared away, "partridges" were common, many of the older residents of the county remembering them, and, more particularly, their drumming in the Spring. They bred, of course. Just when they disappeared from the county is not definitely known, but it was not far from 1860.

FAMILY PHASIENIDÆ.—Turkeys.

49. *MELEAGRIS GALLOPAVO* Linn.—Wild Turkey. Formerly a common resident, breeding; now extinct in the county. It was never abundant after about 1845, but occurred in the county as late as early in the sixties.

ORDER COLUMBÆ.—Pigeons and Doves.

FAMILY COLUMBIDÆ.—Pigeons and Doves.

50. *ECTOPISTES MIGRATORIUS* (Linn.)—Wild Pigeon. Formerly abundant, the great flights of wild pigeons being well

remembered. Now an irregular Spring and Fall migrant; more common in the Fall.

51. *ZENAIIDURA MACROURA*, (Linn.)—Mourning dove; turtle dove. A common resident, abundant in Spring, Summer and Fall, and rare in Winter, when it is represented only by small flocks in the corn-fields. The great bulk of them arrive in March and go South in October and November. In the Fall they gather in flocks, which sometimes number as high as a hundred individuals. Breeds. Three and, exceptionally, four and five broods are raised in a season, the birds not unfrequently nesting on the ground, though the nest is usually found in thick, bushy trees, not far from the ground, or in evergreens.

ORDER RAPTORES.—Birds of Prey.

FAMILY CATHARTIDÆ.—North American Vultures.

52. *CATHARTES AURA* (Linn.)—Turkey vulture. Resident from March to December, during which time it is common. In mild seasons, a few winter along the river hills. Breeds.

53. *CATHARISTA ATRATA* (Bartr.)—Black vulture. A rather uncommon, but regular, Summer resident, from March to October, in the north-east part of the county, along the Little Miami and Cæsar's Creek hills, where it breeds, and is each year becoming more common. On the farm of Commissioner W. J. Collett is a large sycamore tree, in the hollow of which a pair of turkey vultures had nested for a number of years. A few years ago, Mr. Collett informs me, when the turkey vultures had completed their nest, they were driven from it by a pair of black vultures, which took possession, and have used it as a nesting-place each year since. This is, I think, the northernmost record of this vulture breeding, and the first record of its breeding in the State. The first positive record of its appearance in the county I have is my own observation of a pair near Lebanon, in December, 1883. The Cæsar's Creek country residents vary greatly as to the time of the first appearance of the "new kind of buzzard," but it was about eight or ten years ago, since which time they have steadily increased in numbers, and, although even now they are by no means common, yet they are regular Summer residents and breed here each year.

FAMILY FALCONIDÆ.—Falcons, Hawks, Etc.

54. *ELANOIDES FORFICATUS* (Linn.)—Swallow-tailed kite. Formerly an abundant resident in all parts of the State; now seldom, if ever, occurring and it has been practically extinct in the State for twenty years. The older residents of the county well recollect a "swallow-tailed hawk" that was formerly of quite common occurrence in the county, which was, unquestionably, this species.

55. *CIRCUS HUDSONIUS* (Linn.)—Marsh hawk. Rare Spring and Fall migrant, more common in the Fall than in the Spring.

56. *ACCIPITER COOPERI* (Bonap.)—Cooper's hawk. Common resident from March to November, a few stragglers occasionally remaining through the Winter. Breeds.

57. *BUTEO BOREALIS* (Gmel.)—Red-tailed hawk. A not uncommon resident, much more abundant some years than others. Breeds.

58. *BUTEO LINEATUS* (Gmel.)—Red-shouldered hawk. Common resident. Breeds. Our most common large hawk.

59. *BUTEO LATISSIMUS* (Wils.)—Broad-winged hawk. Rather uncommon resident, from April to November. Breeds.

60. *AQUILA CHRYSAETOS* (Linn.)—Golden eagle. Rare migrant, or more properly, an occasional visitant. One or two specimens of this species and several of the next have been taken along the Little Miami hills in recent years.

61. *HALIAETUS LEUCOCEPHALUS* (Linn.)—Bald eagle. Irregular visitant, usually in the Fall or Winter.

62. *FALCO COLUMBARIUS* Linn.—Pigeon hawk. A rare Spring and Fall migrant.

63. *FALCO SPARVERIUS* Linn.—Sparrow hawk. Common resident; the most abundant representative of the order. Breeds. Less common in Winter, but a considerable number remain.

64. *PANDION HALIAETUS CAROLINENSIS* (Gmel.)—Fish hawk. Uncommon Spring and Fall migrant, and is also of irregular occurrence during the Summer.

FAMILY STRIGIDÆ.—Owls.

65. *ASIO WILSONIANUS* (Less.)—Long-eared owl. Very rare Winter resident. I have personal knowledge of but two specimens, one of which was brought to me to mount in the Winter of 1884-5, by some one whose name I have lost; the other I found dead in the fork of a small tree, in which it had apparently been caught while in pursuit of some small bird or mammal. This was in December, 1886. Mr. Dury also records a long-eared owl from this county in 1886.

66. *ASIO ACCIPITRINUS* (Pall.)—Short-eared owl. Ordinarily a rare Winter resident. But during the Fall and Winter of 1886, short-eared owls were abundant throughout the county. They were associated in flocks of from five to thirty individuals. When disturbed from their roosting places, which were usually along drains and water-washed hollows in meadow fields, they would fly rapidly for a short distance and then, sweeping in wide circles, would rise to a height of three or four hundred feet, where they would remain, soaring in large circles, until danger was past. Few have been seen since.

67. *SYRNIUM NEBULOSUM* (Forst.)—Barred owl. An uncommon resident, possibly more common in Winter. Breeds.

68. *MEGASCOPS ASIO* (Linn.)—Screech owl. A common resident. Breeds.

69. *BUBO VIRGINIANUS* (Gmel.)—Great horned owl. A common resident. Breeds in February and March. In speaking of this bird, Dr. Coues says "Eggs said to be 3-6, not known to me to be more than two in number." In the limb of a hollow tree, felled by wood-choppers in March, 1883, near Lebanon, was found a horned owl's nest containing four young owls. One was killed by the fall, but the other three were kept for some time as pets by one of the choppers.

70. *NYCTEA NYCTEA* (Linn.)—Snowy owl. Visitant in severe Winters. Quite a number of specimens have been taken in the county, the last instance of which I have record being the taking of a pair in Harlan, the south-eastern township of the county, early in 1887.

ORDER PSITTACI.—Parrots, Etc.

FAMILY PSITTACIDÆ.—Parrots.

71. *CONURUS CAROLINENSIS* (Linn.)—Paroquet. Formerly an abundant Summer resident, breeding within the memory of persons now living. Has been extinct in the county for many years.

ORDER COCCYGES.—Cuckoos, Kingfishers, Etc.

FAMILY CUCULIDÆ.—Cuckoos.

72. *COCCYZUS AMERICANUS* (Linn.)—Yellow-billed cuckoo; rain crow. An abundant Summer resident from May to September. Breeds.

73. *COCCYZUS ERYTHROPHthalmus* (Wils.)—Black-billed cuckoo. Rare Summer resident, arriving and departing with the last. Probably breeds.

FAMILY ALCEDINIDÆ.—Kingfishers.

74. *CERYLE ALCYON* (Linn.)—Belted kingfisher. A common resident from March to December, and during open seasons a number winter along the creeks and rivers of the county. Breeds.

ORDER PICI.—Woodpeckers.

FAMILY PICIDÆ.—Woodpeckers.

75. *DRYOBATES VILLOSUS* (Linn.)—Hairy woodpecker. Resident; common in Winter, rare in Summer. Probably breeds.

76. *DRYOBATES PUBESCENS* (Linn.)—Downy woodpecker. Common resident, much more common than the last. More abundant in Winter. Breeds.

77. *SPHYRAPICUS VARIUS* (Linn.)—Yellow-bellied woodpecker. A regular, but not very common Spring and Fall migrant in April and November.

78. *CEOPHLEUS PILEATUS* (Linn.)—Pileated woodpecker; log cock. Formerly a common resident. Bred. Well remembered as occurring abundantly by men of middle life, but has been extinct in the county for 20 or 25 years.

79. *MELANERPES ERYTHROCEPHALUS* (Linn.)—Red-headed woodpecker. Resident from March to November in abund-

ance. Breeds. In Mr. Gould's collection there is a very curious albino of this species. In it, the red and white are distributed as in the ordinary bird, but the blue-black area is replaced by one of pale, shaded chocolate. The bird was taken near Lebanon in the Fall of 1879.

80. *MELANERPES CAROLINUS* (Linn.)—Red-bellied woodpecker. Resident; rare in Summer, abundant in Fall, Winter and Spring.

81. *COLAPTES AURATUS*, (Linn.)—Flicker; yellowhammer. An abundant resident. Breeds.

ORDER MACHROCHIRES.—Goatsuckers, Swifts, Etc.

FAMILY CAPRIMULGIDÆ.—Goatsuckers.

82. *ANTROSTOMUS VOCIFERUS* (Wils.)—Whip-poor-will. A rare Summer resident, probably breeding. Is more common in May. Not observed in the Fall.

83. *CHORDEILES VIRGINIANUS* (Gmel.)—Night hawk. Uncommon Summer resident, probably breeding. Common during May, and abundant in September and October.

FAMILY MICROPODIDÆ.—Swifts.

84. *CHÆTURA PELAGICA* (Linn.)—Chimney swift. Abundant Summer resident, from April to October. Breeds.

FAMILY TROCHILIDÆ.—Hummingbirds.

85. *TROCHILUS COLUBRIS* Linn.—Ruby-throated hummingbird. A common Summer resident, from May 1 to September 15.

ORDER PASSERES.—Perching Birds.

FAMILY TYRANNIDÆ.—Tyrant Flycatchers.

86. *TYRANNUS TYRANNUS* (Linn.)—Kingbird. A common Summer resident, from May to September. Breeds.

87. *MYIARCHUS CRINITUS* (Linn.)—Crested Flycatcher. A common Summer resident, from the first of May to the middle of September. Breeds.

88. *SAYORNIS PHŒBE* (Lath.)—Peewee; phœbe. Common Summer resident, from the last of March to the first of October. Breeds. Two and frequently three broods.

89. *CONTOPUS VIRENS* (Linn.)—Wood peewee. Common Summer resident, from May to October. The commonest of the small flycatchers. Breeds.

90. *EMPIDONAX FLAVIVENTRIS* Baird.—Yellow-bellied flycatcher. Spring and Fall migrant; not uncommon.

91. *EMPIDONAX ACADICUS* (Gmel.)—Acadian flycatcher. Resident from May to September. Breeds.

92. *EMPIDONAX MINIMUS* Baird.—Least flycatcher. Spring and Fall migrant, in May and September, arriving and departing with flaviventris.

FAMILY ALAUDIDÆ.—Larks.

93. *OTOCORIS ALPESTRIS* (Linn.)—Horned lark. Resident from October to April, although very severe Winters drive the great bulk of them farther South. Usually abundant in November, when they gather in the meadows in large flocks, but in some seasons only a few are seen.

FAMILY CORVIDÆ.—Crows and Jays.

94. *CYANOCITTA CRISTATA* (Linn.)—Blue jay. A common resident. Breeds.

95. *CORVUS AMERICANUS* Aud.—Crow. A common resident. Breeds. In speaking of the crow as a resident, it should be stated that the crows to be seen in all parts of the county any Winter day, return every evening to the great crow roost at Clifton, a suburb of Cincinnati. Every morning, from November to March, they arrive in the vicinity of Lebanon about an hour after sun-rise. The day is spent searching for food along the numerous water-courses of the county, and about three o'clock in the afternoon they may be seen returning, in small flocks, to the Clifton roost. So, while during the daytime, in Winter, crows are more abundant than at any other time of the year, by five o'clock in the afternoon there is probably not a crow left in the county.

FAMILY ICTERIDÆ.—Orioles.

96. *DOLICHONYX ORYZIVORUS*, (Linn.)—Bobolink. Uncommon migrant, early in May, in small flocks. Breeds at Yellow Springs (Wheaton), twenty miles north of the Warren County line.

97. *MOLOTHRUS ATER* (Bodd.)—Cowbird. Abundant Summer resident, from the last of February to October. Breeds.

98. *AGELAIUS PHŒNICEUS* (Linn.)—Red-winged blackbird. Common Summer resident, arriving and departing with the last species. Abundant during the migrations. Breeds.

99. *STURNELLA MAGNA* (Linn.)—Meadow lark. An abundant resident from March 1st to December 1st, and, except in very severe seasons, a number remain throughout the year. Breeds.

100. *ICTERUS SPURIUS* (Linn.)—Orchard Oriole. Rather common Summer resident, from May 1st to September 1st. Breeds.

101. *ICTERUS GALBULA* (Linn.)—Baltimore oriole. Common Summer resident, from the last of April to the middle of September. Breeds.

102. *SCOLEOPHAGUS CAROLINUS* (Müll.)—Rusty blackbird. Common Spring and Fall migrant, in April, May, October and November.

103. *QUISCALUS QUISCULA ÆNEUS* (Ridgw.)—Bronzed grackle; blackbird. Abundant resident, from the last of February to the first of November. Very numerous, in great flocks, during the migrations. Breeds. One seen December 30, 1887.

FAMILY FRINGILLIDÆ.—Finches, Sparrows, Etc.

104. *CARPODACUS PURPUREUS* (Gmel.)—Purple finch. Migrant in April, May and October. Probably a rare Winter resident.

105. *LOXIA CURVIROSTRA MINOR* (Brehm.)—American crossbill. Rare and irregular Winter visitant. None have been observed in this county in recent years, but a flock of them appeared at Wilmington, some eight miles east of the county line, in February, 1887.

106. *LOXIA LEUCOPTERA*, Gmel.—White-winged crossbill. Very irregular Winter visitant; not observed for a number of years.

107. *SPINUS TRISTIS* (Linn.)—Goldfinch. Abundant resident; less common in Winter. Breeds.

108. *PLECTROPHENAX NIVALIS* (Linn.)—Snow bunting. Irregular Winter visitant; not observed for several years.

109. *POOCÆTES GRAMINEUS* (Gmel.)—Grass finch. A common resident, from April to November. Breeds.

110. *AMMODRAMUS SANDWICHENSIS SAVANNA* (Wils.)—Savanna sparrow. A not uncommon Spring and Fall migrant.

111. *AMMODRAMUS SAVANNARUM PASSERINUS*, (Wils.)—Yellow-winged sparrow. A very rare Summer resident. One specimen only, identified at Franklin, in the northwestern part of the county, June 30, 1890, which was in song at the time. Probably breeds.

112. *CHONDESTES GRAMMACUS* (Say.)—Lark finch. Migrant during the last of April and the first of May, and the last of August and the first of September. Uncommon. Is a rare Summer resident and breeder.

113. *ZONOTRICHIA LEUCOPHRYS* (Forst.)—White-crowned sparrow. Migrant with the next species, but less common.

114. *ZONOTRICHIA ALBICOLLIS* (Gmel.)—White-throated sparrow. Common Spring and Fall migrant, in April, May, October and November.

115. *SPIZELLA MONTICOLA* (Gmel.)—Tree sparrow. Common Winter resident, from October to April.

116. *SPIZELLA SOCIALIS* (Wils.)—Chipping sparrow. Abundant Summer resident, from the last of March to the last of October. Breeds.

117. *SPIZELLA PUSILLA* (Wils.)—Field sparrow. Common Summer resident, arriving and departing with the last species. Breeds.

118. *JUNCO HYEMALIS* (Linn.)—Snowbird. Abundant Winter resident, from October 15 to April 15.

119. *MELOSPIZA FASCIATA* (Gmel.)—Song sparrow. Abundant resident. Breeds.

120. *MELOSPIZA LINCOLNI* (Aud.)—Lincoln's sparrow. Rare migrant. One specimen only, taken near Lebanon, May 2, 1890.

121. *MELOSPIZA GEORGIANA* (Lath.)—Swamp sparrow. Spring and Fall migrant, in April and October.

122. *PASSERELLA ILIACA* (Merr.)—Fox sparrow. A not uncommon Spring and Fall migrant.

123. *PIPILO ERYTHROPHthalmus* (Linn.)—Ground robin. Common resident, from March to November, and a few may Winter in the county in mild seasons. Breeds.

124. *CARDINALIS CARDINALIS* (Linn.)—Cardinal grosbeak; redbird. A common resident. Breeds.

125. *HABIA LUDOVICIANA* (Linn.)—Rose-breasted grosbeak. Uncommon Spring and Fall migrant, in April, May and September.

126. *PASSERINA CYANEA* (Linn.)—Indigo bunting. A common resident, from May to October.

127. *SPIZA AMERICANA* (Gmel.)—Dickcissel. Abundant Summer resident from May to September. Breeds.

128. *PASSER DOMESTICUS*, Linn.—English sparrow. Abundant resident. Breeds. Introduced about 1875.

FAMILY *TANAGRIDÆ*.—Tanagers.

129. *PIRANGA ERYTHROMELAS* Viell.—Scarlet tanager. Rare Summer resident, quite common during May and September. Breeds.

130. *PIRANGA RUBRA* (Linn.)—Summer tanager. Arrives and departs with the last species. Less common during the migrations, but more remain during the Summer. Breeds.

FAMILY *HIRUNDINIDÆ*.—Swallows.

131. *PROGNE SUBIS* (Linn.)—Martin. A common Summer resident, from April to September. Breeds.

132. *PETROCHELIDON LUNIFRONS* (Say.)—Eave swallow. Common Summer resident, from the middle of April to the middle of September. Breeds.

133. *CHELIDON ERYTHROGASTER* (Bodd.)—Barn swallow. Common Summer resident, from April to September. Breeds.

134. *TACHYcineta BICOLOR* (Viell.)—White-bellied swallow. Uncommon migrant in May and September.

135. *CLIVICOLA RIPARIA* (Linn.)—Bank swallow. Common Summer resident, from April to September. Breeds.

136. *STELGIDOPTERYX SERRIPENNIS* (Aud.)—Rough-winged swallow. Summer resident, arriving and departing with the last species. Breeds.

FAMILY AMPELIDÆ.—Waxwings.

137. *AMPELIS CEDRORUM* (Viell.)—Cedar bird. A very irregular bird. Usually common during the migrations, but in some seasons quite rare. Sometimes an uncommon Summer resident, probably breeding, again not observed at all during other Summers. At times appearing so late in the Fall and so early in the Spring (November 29th; January 25th), as to give the impression that in some years it may be a rare Winter resident.

FAMILY LANIIDÆ.—Shrikes.

138. *LANIUS LUDOVICIANUS* Linn.—Loggerhead shrike. Spring and Fall migrant and uncommon Summer resident. Breeds.

139. *LANIUS LUDOVICIANUS EXCUBITORIDES* (Swain.)—White-rumped shrike. Migrant and resident with the last. Probably breeds.

The shrikes of this locality are just on the border line between the loggerheads and the white-rumps, and in many cases it is almost impossible to distinguish the variety. Dr. F. W. Langdon, of Cincinnati, who is an authority on the birds of this section, considers the white-rump our common variety. I have never found it nesting in this county, as I have undoubted loggerheads, but it unquestionably breeds.

FAMILY VIREONIDÆ.—Vireos.

140. *VIREO OLIVACEUS* (Linn.)—Red-eyed vireo. Common Summer resident, from May to October. Breeds.

141. *VIREO GILVUS* (Viell.)—Warbling vireo. Common Summer resident, arriving and departing with the last. Breeds.

142. *VIREO FLAVIFRONS* Viell.—Yellow-throated vireo. Migrant in May and September. Possibly a rare Summer resident, but not noted as such.

143. *VIREO NOVEBORACENSIS* (Gmel.)—White-eyed vireo. Summer resident, May to September. Breeds.

FAMILY MNIOTILTIDÆ.—Warblers.

144. *MNIOTILTA VARIA* (Linn.)—Summer resident, from May to September. Breeds. As in the case with all warblers which are Summer residents in the county, is much more common during the migrations.

145. *HELMINTHOPHILA PINUS* (Linn.)—Blue-winged warbler. Rather uncommon Summer resident. Breeds.

146. *HELMINTHOPHILA PEREGRINA* (Wils.)—Tennessee warbler. Common Spring and Fall migrant.

147. *DENDROICA ÆSTIVA* (Gmel.)—Yellow warbler. Abundant Summer resident, from the middle of May to the last of August. Breeds.

148. *DENDROICA CÆRULESCENS* (Gmel.)—Black-throated blue warbler. Uncommon migrant, in May and September.

149. *DENDROICA CORONATA* (Linn.)—Yellow-rumped warbler. A common migrant, in April, May and October.

150. *DENDROICA MACULOSA* (Gmel.)—Black and yellow warbler. Migrant in May and September; much more common in the Fall.

151. *DENDROICA CÆRULEA* (Wils.)—Cerulean warbler. Rather common migrant and rare Summer resident, from May to August. Breeds.

152. *DENDROICA PENSYLVANICA* (Linn.)—Chestnut-sided warbler. Spring and Fall migrant; common in September.

153. *DENDROICA CASTANEA* (Wils.)—Bay-breasted warbler. Spring and Fall migrant; common in September.

154. *DENDROICA STRIATA* (Forst.)—Black-poll warbler. Rare migrant, in May and September.

155. *DENDROICA BLACKBURNIÆ* (Gmel.)—Blackburnian warbler. Migrant in May and September; much more common during the latter month.

156. *DENDROICA DOMINICA ALBILORA*, Baird. Sycamore warbler. Common migrant in April, and is one of the first, if not the first, of the warblers to arrive. Not observed in the Fall.

157. *DENDROICA VIRENS* (Gmel.)—Black-throated green warbler. Common Spring and Fall migrant.

158. *DENDROICA PALMARUM* (Gmel.)—Yellow red-poll warbler. Migrant in April and October; more common in the Fall.

159. *SEIURUS AUROCAPILLUS* (Linn.)—Golden-crowned water thrush. Summer resident, from April to September. Breeds.

160. *SEIURUS MOTACILLA* (Viell.)—Large-billed water thrush. Common Summer resident, in the thickly wooded hills along the Little Miami; comparatively rare elsewhere in the county. Arrives early in April and leaves the last of August. Breeds.

161. *GEOTHLYPIS FORMOSA* (Wils.)—Kentucky warbler. Uncommon Summer resident. Probably breeds.

162. *GEOTHLYPIS AGILIS* (Wils.)—Connecticut warbler. Very rare migrant. One specimen only, taken near Lebanon, in May, 1879, and now in Mr. Gould's collection.

163. *GEOTHLYPIS PHILADELPHIA* (Wils.)—Mourning warbler. Rare migrant. One specimen only, taken at Ft. Ancient, May 26, 1890.

164. *GEOTHLYPIS TRICHAS* (Linn.)—Maryland yellow-throat. Summer resident, from May to September; common during the migrations. Breeds.

165. *ICTERIA VIRENS* (Linn.)—Yellow-breasted chat. Common Summer resident, from the middle of May to the first of September. Breeds.

166. *SETOPHAGA RUTICILLA* (Linn.)—Redstart. Summer resident, from May to September; much more common during the migrations. Breeds.

FAMILY MOTACILLIDÆ.—Wagtails.

167. *ANTHUS PENNSILVANICUS* (Lath.)—Titlark. Spring and Fall migrant, in March, April and November, in flocks.

FAMILY TROGLODYTIDÆ.—Wrens.

168. *MIMUS POLYGLOTTOS* (Linn.)—Mockingbird. A rare Summer resident. Breeds. Mr. Gould's collection contains an albino mocking bird. It is not pure white, and all the markings of the ordinary bird can be made out, but the col-

oring is so light that, at a little distance, it seems to be almost white. It was shot in a swamp in Mississippi, early in 1882.

169. *GALEOSOPTES CAROLINENSIS* (Linn.)—Catbird. Abundant Summer resident, from the middle of April to the first of October. Breeds.

170. *HARPORHYNCHUS RUFUS* (Linn.)—Brown thrush. Common Summer resident, from April to September. Breeds.

171. *THRYOTHORUS LUDOVICIANUS* (Lath.)—Carolina wren. Common resident. Breeds.

172. *THRYOTHORUS BEWICKII* (Aud.)—Bewick's wren. A rare Summer resident, probably a comparatively recent addition to the fauna of the county. Its rarity prevents the giving of dates of arrival and departure, with anything like certainty, but I have seen it as early as April 15th and as late as August 10th. Probably breeds.

173. *TROGLODYTES AEDON* (Viell.)—House wren. Formerly a rather common resident. Of late years, quite rare. Breeds.

174. *TROGLODYTES HIEMALIS* Viell.—Winter wren. Uncommon Winter visitant, November to April.

175. *CISTOTHORUS PALUSTRIS* (Wils.)—Long-billed marsh wren. Rare Spring and Fall migrant.

FAMILY *CERTHIDÆ*.—Creepers.

176. *CERTHIA FAMILIARIS AMERICANA* (Bonap.)—Brown creeper. Common migrant in March, April, October and November, and rare Winter resident.

FAMILY *PARIDÆ*.—Nuthatches and Titmice.

177. *SITTA CAROLINENSIS* Lath.—White-bellied nuthatch. Resident; more common in Winter. Breeds.

178. *SITTA CANADENSIS* Linn.—Red-bellied nuthatch. Irregular Winter visitant, sometimes in considerable numbers. Not observed since December, 1888.

179. *PARUS BICOLOR* Linn.—Tufted titmouse. Resident; more common in Winter. Breeds.

180. *PARUS CAROLINENSIS* Aud.—Carolina chickadee. A common resident, more numerous in Winter. Breeds.

FAMILY SYLVIIDÆ.—Kinglets, Etc.

181. *REGULUS SATRAPA* Licht.—Golden-crowned kinglet. Common Spring and Fall migrant, usually in small flocks. A rare Winter resident.

182. *REGULUS CALENDULA* (Linn.)—Ruby-crowned kinglet. Uncommon, but regular migrant, in April and October.

183. *POLIOPTILA CÆRULEA* (Linn.)—Blue-gray gnatcatcher. Summer resident, April to August; more common in the Spring. Breeds.

FAMILY TURDIDÆ.—Thrushes.

184. *TURDUS MUSTELINUS* Gmel.—Wood thrush. Common Summer resident, from April to October. Breeds.

185. *TURDUS ALICIÆ* Baird.—Gray-cheeked thrush. Migrant in May, September and October.

186. *TURDUS USTULATUS SWAINSONII* (Cab.)—Olive-backed thrush. A very common migrant in April, May and September.

187. *TURDUS AONALASCHÆ PALLASII* (Cab.)—Hermit thrush. Common migrant, in April, May, September and October.

188. *MERULA MIGRATORIA* (Linn.)—Robin. Abundant resident, from February to November, and a small number sometimes Winter in the county. Very numerous, in large straggling flocks, during the migrations. Breeds.

189. *SIALIA SIALIS* (Linn.)—Bluebird. Common resident, from February to November, and a few usually remain through the Winter. Breeds.

LIST OF BIRDS OF PROBABLE OCCURRENCE.

In the following list are the names of a number of birds, which, to a practical certainty, occur in the county, so much so that quite a number of them might have been included in the list proper with perfect safety, and were only barred out by the rigidly adhered to rule of including no bird whose identification within the county lines was not positive and certain. It is true that the majority of these will be found to be rare, but as they are unquestionably of tolerably reg-

ular occurrence in the county, the irregularity of my own observations must account for the fact that I have overlooked them and have no other records to which to refer. Birds of this class may be distinguished in the following list by the quotations attached to their names, the Cincinnati quotations being from Dr. F. W. Langdon's list of Cincinnati birds, and those from the State at large from Dr. Wheaton's work on the birds of the State, published in the report of the Ohio Geological Survey. Any other authorities are named. The birds to which no quotations are attached are birds which have occurred in the State, many of them being recorded from the vicinity of Cincinnati. They are birds which are liable to occur in the county any year (except a few species here included on the probability of their occurrence in former years, of which some record may yet be found), but such occurrences will in all probability be found to be very irregular, and many of them would come under the head of accidental.

FAMILY PODICIPIDÆ.

1. COLYMBUS HOLBÆLLII (Reinh.)—Holbøell's grebe.

FAMILY URINATORIDÆ.

2. URINATOR LUMME (Gunn.)—Red-throated loon.

FAMILY LARIDÆ.

3. LARUS MARINUS Linn.—Great black-backed gull.
4. LARUS DELAWARENSIS Ord.—Ring-billed gull.
5. LARUS ATRICILLA Linn.—Laughing gull.
6. GLOCHELIDON NILOTICA (Hasselq.)—Gull-billed tern.
7. STERNA FORSTERI Nutt.—Forster's tern.
8. STERNA DOUGALLI Montag.—Roseate tern.
9. STERNA ANTILLARUM (Less.)—Least tern.

FAMILY PELECANIDÆ.

10. PELECANUS ERYTHORHYNCHUS Gmel.—White-pelican.

FAMILY ANATIDÆ.

11. MERGANSER AMERICANUS (Cass.)—Merganser.

12. *MERGANSER SERRATOR* (Linn.)—Red-breasted merganser.
13. *ANAS OBSCURA* Gmel.—Dusky duck. "Spring and Fall migrant" at Cincinnati. Probably a rare migrant on the Miamis.
14. *ANAS STREPERA* Linn.—Gadwall.
15. *AYTHYA VALLISNERIA* (Wils.)—Canvasback. "Rare migrant" at Cincinnati. In the State "common on Lake Erie, less common at the St. Mary's Reservoir, and rather rare generally throughout the State."
16. *AYTHYA MARILA NEARCTICA* Stejn.—Scaup duck.
17. *GLAUCIONETTA CLANGULA AMERICANA* (Bonap.)—Goldeneye. "An uncommon migrant" at Cincinnati. In the State "not very common" Spring and Fall migrant and Winter resident.
18. *OIDEMIA FUSCA* (Linn.)—Velvet scoter.
19. *CHEN HYPERBOREA* (Pall.)—Lesser snow goose.
20. *ANSER ALBIFRONS GAMBELI*, (Hartl.)—White-fronted goose.
21. *BRANTA BERNICLA* (Linn.)—Brant goose.
22. *OLOR COLUMBIANUS* (Ord.)—Whistling swan.
23. *OLOR BUCCINATOR* (Rich.)—Trumpeter swan.

FAMILY IBIDIDÆ.

24. *PLEGADIS AUTUMNALIS* (Hasselq.)—Glossy ibis.

FAMILY CINCONIDÆ.

25. *TANTALUS LOCULATOR* Linn.—Wood ibis.

FAMILY ARDEIDÆ.

26. *BOTAURUS EXILIS* (Gmel.)—Least bittern. "Rare Spring and Fall migrant" at Cincinnati. Not common resident in the Northern part of the State. Doubtfully identified in this county.
27. *ARDEA CANDISSIMA* Gmel.—Snowy heron.

FAMILY GRUIDÆ.

28. *GRUS AMERICANA* (Linn.)—Whooping crane.
29. *GRUS MEXICANA* (Müll.)—Sandhill crane.

FAMILY RALLIDÆ.

- 30. *PORZANA NOVEBORACENSIS* (Gmel.)—Yellow-rail. "Rare Spring and Fall migrant" at Cincinnati. "Not common Spring and Fall migrant, probably Summer resident" in the State.
- 31. *PORZANA JAMAICENSIS* (Gmel.)—Black rail.
- 32. *IONORNIS MARTINICA* (Linn.)—Purple gallinule.
- 33. *GALLINULA GALATEA* (Licht.)—Florida gallinule.

FAMILY PHALAROPODIDÆ.

- 34. *CRYMOPHILUS FULICARIUS* (Linn.)—Red phalarope.
- 35. *PHALAROPUS LOBATUS* (Linn.)—Northern phalarope
- 36. *PHALAROPUS TRICOLOR* (Viell.)—Wilson's phalarope.

FAMILY RECURVIROSTRIDÆ.

- 37. *HIMANTOPTUS MEXICANUS* (Müll.)—Black-necked stilt.

FAMILY SCOLOPACIDÆ.

- 38. *MACRORHAMPUS GRISEUS* (Gmel.)—Red-breasted snipe. "Rare Spring and Fall migrant" at Cincinnati. "Not common migrant" in the State.
- 39. *MICROPALMA HIMANTOPUS* (Bonap.)—Stilt sandpiper.
- 40. *TRINGA CANUTUS* Linn.—Knot.
- 41. *TRINGA BAIRDII* (Coues.)—Baird's sandpiper.
- 42. *CALIDRIS ARENARIA* (Linn.)—Sanderling.
- 43. *LIMOSA FEDOA* (Linn.)—Marbled godwit.
- 44. *LIMOSA HÆMASTICA* (Linn.)—Hudsonian godwit.
- 45. *BARTRAMIA LONGICAUDA* (Bechst.)—Upland plover.
- 46. *TRYNGYTES SUBRUFICOLLIS* (Viell.)—Buff-breasted sandpiper.
- 47. *NUMENIUS LONGIROSTRIS* Wils.—Long-billed curlew.
- 48. *NUMENIUS HUDSONICUS* Lath.—Hudsonian curlew.
- 49. *NUMENIUS BOREALIS* (Forst.)—Eskimo curlew.

FAMILY CHARADRIIDÆ.

- 50. *CHARADRIUS SQUATAROLA* (Linn.)—Black-bellied plover. "Rare Spring and Fall migrant" at Cincinnati. "Rather rare

Spring and Fall migrant, more frequently seen on the lake shore than elsewhere" in the State.

51. *ÆGIALITIS SEMIPALMATA* Bonap. — Semipalmated plover. "Uncommon Spring and Fall migrant" at Cincinnati. "Not common in Spring, more abundant in Fall" in the State.

52. *ÆGIALITIS MELODA* (Ord.) — Piping plover.

FAMILY APHRIZIDÆ.

53. *ARENARIA INTERPRES* (Linn.) — Turnstone.

FAMILY TETRAONIDÆ.

54. *TYMPANUCHUS AMERICANUS* (Reich.) — Prairie chicken.

FAMILY FALCONIDÆ.

55. *ACCIPITER VELOX* (Wils.) — Sharp-shinned hawk. "Rare Summer resident" at Cincinnati. "Breeds" at Cincinnati—Dury. In the State, "common resident in northern, less common in middle and southern Ohio."

56. *ACCIPITER ATRICAPILLUS* (Wils.) — Goshawk.

57. *ARCHIBUTEO LAGOPUS SANCTI-JOHANNIS* (Gmel.) — Rough-legged hawk.

58. *FALCO PEREGRINUS ANATUM* (Bonap.) — Duck hawk.

FAMILY STRIGIDÆ.

59. *STRIX PRATINCOLA* Bonap. — Barn owl.

60. *ULULA CINEREA* (Gmel.) — Great gray owl.

61. *NYCTALE ACADICA* (Gmel.) — Saw-whet owl. "Rare visitant in Winter" at Cincinnati. In the State "not common resident in the northern, resident or Winter visitor in middle and southern Ohio."

62. *SURNIA ULULA CAPAROCH* (Müll.) — American hawk-owl.

FAMILY PICIDÆ.

63. *CAMPEPHILUS PRINCIPALIS* (Linn.) — Ivory-billed woodpecker.

FAMILY TYRANNIDÆ.

64. *CONTOPUS BOREALIS* (Swains.) — Olive-sided flycatcher.

65. *EMPIDONAX PUSILLUS TRAILLII* (Aud.) — Traill's fly-catcher. "Rare migrant in May and September," at Cincinnati. "Common Summer resident in central Ohio, from May to September. Breeds."

FAMILY ALAUDIDÆ.

66. *OTOCORIS ALPESTRIS PRATICOLA* Hensh. — Prairie horned lark. "Habitat, upper Mississippi Valley and the region of the great lakes."—A. O. U. Checklist. Almost certainly identified. Probably a rare Summer resident. On July 2, 1890, I saw, about two miles south of Lebanon, what was unquestionably a horned lark. What was probably the same bird, was seen at the same place the following day, making the identification certain as to species, but not as to variety, which, however, was almost certainly that named above. The bird was in song, and probably was breeding.

FAMILY CORVIDÆ.

67. *CORVUS CORAX SINUATUS* (Wagl.)—Raven. Formerly a not uncommon resident in this part of the State, at which time it almost certainly occurred in this county, but I have been unable to get any certain record of its appearance here.

FAMILY FRINGILLIDÆ.

68. *ACANTHIS LINARIA* (Linn.)—Redpoll.

69. *SPINUS PINUS* (Wils.) — Pine linnet. At Cincinnati "abundant in the Winter of 1868-9."—Dury. In the State "abundant, nearly resident; possibly breeding in northern Ohio; Winter visitor in other parts of the State."

70. *CALCARIUS LAPPONICUS* (Linn.) - Lapland longspur. "Rare and irregular visitant" at Cincinnati. "Common and tolerably regular Winter visitor in the vicinity of Columbus."

71. *GUIRACA CÆRULEA* (Linn.)—Blue grosbeak.

FAMILY LANIIDÆ.

72. *LANIUS BOREALIS* Viell.—Butcher bird. "Rare Fall and Winter visitant" at Cincinnati. In the State, "irregular and not very common Winter visitor."

FAMILY VIREONIDÆ.

73. *VIREO PHILADELPHICUS* (Cass.)—Philadelphia vireo. "Rare migrant in May and September," at Cincinnati. "Not very common, but regular, Spring and Fall migrant" in the State.

74. *VIREO SOLITARIUS* (Wils.)—Solitary vireo. At Cincinnati "rare migrant in May,"—Byrnes, Dury, "and September,"—Shorten. In the State, "not common Spring and Fall migrant in southern and middle Ohio."

FAMILY MNIOTILTIDÆ.

75. *PROTONOTARIA CITREA* (Bodd.)—Prothonotary warbler.

76. *HELMINTHERUS VERMIVORUS* (Gmel.)—Worm-eating warbler. "Rare Summer resident May to August," at Cincinnati. In the State, "rare Summer resident."

77. *HELMINTHOPHILA CHRYSOPTERA* (Linn.)—Golden-winged warbler.

78. *HELMINTHOPHILA RUFICAPILLA* (Wils.)—Nashville warbler. "Migrant in April, May and September," at Cincinnati. "Regular Spring and Fall migrant; common" in the State.

79. *HELMINTHOPHILA CELATA* (Say.)—Golden-crowned warbler.

80. *COMSOTHTYPIS AMERICANA* (Linn.)—Parula warbler. "Not common migrant in May and September," at Cincinnati. In the State, "not common Spring and Fall migrant in southern and middle, Summer resident in northern Ohio."

81. *DENDROICA TIGRINA* (Gmel.)—Cape May warbler. "Rare migrant in May and September," at Cincinnati and throughout the State.

82. *DENDROICA KIRTLANDI* Baird.—Kirtland's warbler.

83. *DENDROICA VIGORSII* (Aud.)—Pine warbler. "Rare migrant in April," at Cincinnati. In the State, "not common Spring and Fall migrant."

84. *DENDROICA DISCOLOR* (Viell.)—Prairie warbler. "Rare migrant in May," at Cincinnati. In southern and middle Ohio "a rare Spring and Fall migrant."

85. *SEIURUS NOVEBORACENSIS* (Gmel.) — Water thrush. "Rare migrant in May," at Cincinnati. In the State, "common Spring and Fall migrant."

86. *SYLVANIA MITRATA* (Gmel.)—Hooded warbler. "Rare migrant in May," at Cincinnati. In the State, "rare Summer resident." Doubtfully identified in this county.

87. *SYLVANIA PUSILLA* (Wils.)—Wilson's warbler. "Spring and Fall migrant, not common" at Cincinnati. In the State, "not common migrant in the Spring; abundant in the Fall."

88. *SYLVANIA CANADENSIS* (Linn.)—Canadian warbler. "Migrant in May and September; rather rare" at Cincinnati. In the State, "rather common migrant in the Spring; more rare in the Fall."

FAMILY TROGLODYTIDÆ.

89. *CISTOTHORUS STELLARIS* (Licht.)—Short-billed marsh wren.

FAMILY PARIDÆ.

90. *PARUS ATRICAPILLUS* Linn.—Black-capped chickadee. "Rare Winter visitant" at Cincinnati. In the State, "abundant resident in northern and probably eastern Ohio; not common Winter visitor in central and southern Ohio."

FAMILY TURDIDÆ.

91. *TURDUS FUSCESCENS* Steph.—Wilson's thrush. "Rare migrant in April," at Cincinnati. In the State, "Spring and Fall migrant in southern and central Ohio; Summer resident in northern Ohio."

MAR 17 1892

THE JOURNAL
- OF THE -
Cincinnati Society of Natural History.

VOL. XIV. · CINCINNATI, OCT., 1891, - JAN., 1892 · NOS. 3 & 4.

PROCEEDINGS.

REGULAR MEETING, August 4, 1891.

The Society was called to order at 8.15 P. M., President Abert in the chair.

Mr. D. W. Miller read a paper on "The Science of Harmony, or Use of Harmonics and Resultant Tones in the Formation and Progression of Chords," which was well received by the small but appreciative audience.

There being no quorum present, no further business was transacted.

REGULAR MEETING, September 1, 1891.

The Society was called to order at 8.20 P. M., President Abert in the chair.

President Abert read a paper entitled "Comparative Measurements and Proportions of the Human Form," which was listened to with much interest by those present.

As there was not a quorum of members present, no business was transacted.

For the meetings of July, October, November and December there was no quorum present, and no papers read.

DONATIONS TO JANUARY 1, 1892.

From O. J. Wilson, W. P. Anderson, Frank J. Jones, L. B. Harrison, Julius Dexter and Robert Clarke: A fine collection of East India Corals and Marine Shells, valued at \$400.00.

From J. Ralston Skinner: Several specimens of Fungus (*Astraeus hygrometricus*), from Watch Hill, R. I.

From The Cuvier Club: The D. H. Shaffer collection of Shells, Minerals and Fossils.

From Col. Jacob Bauer: Skin of a Catfish, tanned.

From E. O. Hurd: Red Squirrel and Long-tailed Duck, both from Minnesota, mounted.

From Miss Bessie Owens: Texas Wild-cat, mounted.

BOOKS AND PAMPHLETS.

From Hon. B. Butterworth: Reports of Smithsonian Inst., 1888-89; Bulletin of U. S. Fish Com., Vol. VIII, 1888; Report of Director of U. S. Geological Survey, Vol. IV., 1888-89; Contributions to N. A. Ethnology, Vol. VI., Fourth Annual Report Bureau of Ethnology, 1882-83; Reports of S. P. Langley, 1889-90; Bulletin No. 1, U. S. Board of Geographic Names; Bibliography of the Chemical Influence of Light; Monographs U. S. Geol. Sur., Vol. X.; Tenth Annual Report U. S. Geol. Sur.; Bulletins of U. S. Geol. Sur., Vols. IV. and V.; Report of Sec. of Int., 1886-87, Vol. III, part 2; Bulletins 14, 15, 16 and 17. U. S. Coast and Geodetic Survey; U. S. Geol. and Geog. Survey of the Territories of Wyoming and Idaho, parts 1 and 2, with maps; Report of Explorations made during 1888 in the Allegheny Region of Virginia, N. Carolina and Tennessee, and in Western Indiana, with an account of the Fishes found in each of the river basins of these regions, by David Starr Jordan; Suggestions for the employment of improved types of vessels in the market fisheries, with notes on British fishing steamers, by J. W. Collins; The most recent methods of Hatching Fish Eggs; Notes on the Fishes collected at Cozumel, Yucatan, by Tarleton H. Bean; Explorations of the Fishing Grounds of Alaska, Washington and Oregon during 1888, by the U. S. Fish Com. Steamer Albatross; The Fisheries and Fishing Industries of the United

States; Bulletin 6, Experiment Station; Insect Life, Vol. I., No. 1; Journal of Mycology, Vol. VI., No. 2; Experiment Station Record, Vol. I., Nos. 2, 5 and 6, Vol. II., Nos. 1, 5, 6 and 7; Report of Microscopist for 1889; Bureau of Education, Circular of Information, No. 9, 1890.

From Prof. Jos. F. James, author: Manual of the Palæontology of the Cincinnati Group.

From State Historical Society of Wisconsin: Wisconsin Historical Collections, Vols. 2 and 3, unbound, and Vols. 4, 8, 10 and 11 bound.

From S. A. Miller: Advance sheets of the 17th Report of the Geological Survey of Indiana, Palæontology; Two copies of 16th Report of the State Geologist of Indiana.

From Robert Clarke: The Solar Parallax and its Relative Constants.

From Erwin F. Smith, author: Chemistry of Peach Yellows; The Black Peach Aphis.

From Dr. Jas. A. Henshall: Bulletins of the Department of Agriculture, France, 1890, Nos. 2 and 5, 1891, Nos. 1, 2 and 5; the 13th, 14th and 15th Annual Report of the Ohio Fish and Game Commission.

ACCESSIONS TO THE LIBRARY DURING THE YEAR 1891:

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American Journal of Science, Vols. XLI and XLII.

American Naturalist, Vol. XXV.

American Philosophical Society, Pro., No. 135.

American Antiquarian, Vol. XIII.

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American Monthly Microscopical Journal, Vol. XII.

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Contributions to N. A. Ethnology, Vol. VI.
Chemistry of Peach Yellows, Erwin F. Smith.
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tin 5; What is Forestry? Annual Reports of Secretary,
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Department of Agriculture, France: Bulletins, 1890, Nos.
2 and 5; Bulletins, 1891, Nos. 1, 2 and 5.
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Explorations of the Fishing Grounds of Alaska, Washington and Oregon during 1888, by the U. S. Fish Com. Steamer Albatross.

Geological Soc. of London, Proceedings No. 561-577.

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Most Recent Methods of Hatching Fish Eggs.

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NORTH AMERICAN FUNGI.

BY A. P. MORGAN.

Fifth Paper.

(Continued from Vol. XIII., p. 21.)

(Read February 2, 1892.)

THE GASTROMYCETES.

Genus X.—BOVISTELLA, Morg., nov. gen.

Mycelium funicular, rooting from the base. Peridium subglobose, with a well-developed base; cortex a dense floccose subsistent coat; inner peridium thin, membranaceous, dehiscent by a regular apical mouth. Subgleba cellulose, cup-shaped above and definitely limited, persistent; capillitium originating within the tissue of the gleba; the threads free, short, several times dichotomously branched, the main stem thicker than the diameter of the spores, the branches tapering; spores small, globose or oval, even, pedicellate.

A puff ball of moderate size, growing in fields and open woods; it has the peridium of a Lycoperdon and the capillitium of a Bovista. The threads of the capillitium originate within the tissue of the gleba, along with the spores, and after deliquescence are left perfectly free within the peridium; they are altogether different from the slender subhyaline hyphæ which compose the wall of the inner peridium and have no connection with them.

1. B. OHIENSIS, Ellis & Morgan. Peridium globose or broadly obovoid, sometimes much depressed, plicate underneath, with a thick cord-like root. Cortex a dense floccose coat, sometimes segregated into soft warts or spines, white or grayish in color; this dries up into a thick buff-colored or dirty ochraceous layer, which gradually falls away, leaving a smooth, shining pale-brown or yellowish surface to the inner peridium. Subgleba broad, ample, occupying nearly one-half the peridium, a long time persistent; mass of spores and capillitium lax, friable, clay-color to pale-brown; the threads

.6-.8 mm. in extent, three to five times branched, the main stem 6-8 mic. in thickness, the branches tapering; spores globose or oval, even, 4-5 mic. in length by 3.5-4 mic. in breadth, with long hyaline persistent pedicels. See Plate V., Figs. 1, 2, 3.

Growing on the ground in old pastures in fields and open woods. South Carolina, *Ravenel, Atkinson*; Florida, *Brown*; Mississippi, *Tracy*; Louisiana, *Langlois*; Ohio, *Morgan*; Indiana, *Gentry*; Illinois, *Schneck*; Missouri, *Trelease*. Peridium $1\frac{1}{2}$ -3 inches in diameter and about the same in height. This is *Mycenastrum Ohiense*, Ell. & Mor. Journal of Mycology, Vol. I, p. 89.

Genus XI.—CATASTOMA, Morg., nov. gen.

Mycelium filamentous, proceeding from all parts of the surface. Peridium subglobose, without a thickened base; cortex a fragile coat of loosely interwoven hyphae, after maturity torn asunder, leaving the lower part in the ground and a cap-shaped portion adherent above; inner peridium subcoriaceous, dehiscent by a basal aperture. Capillitium originating from the inner surface of the peridium; the threads long, branched, subhyaline, after maturity gradually breaking up into short pieces, which appear among the spores as free, short, simple or scarcely branched threads with blunt extremities; spores globose, warted, pale-brown, sessile or pedicellate.

Puffballs growing just beneath the surface of the ground and connected immediately with it by filamentous threads, which issue from every part of the cortex; after maturity, when the peridium breaks away, the lower part of the outer coat is held fast by the soil, while the upper portion, which has attained the surface, remains, covering the inner peridium like a cap or inverted cup; consequently the apparent apex at which the mouth is situated is the actual base of the plant as it grows. The capillitium threads are similar to the densely interwoven hyphae, which form the inner peridium and are evidently branches of them radiating into the interior. It is plain that the affinities of these plants are closest with *Tylostoma* and *Astræus*, but the needs of a systematic arrangement, according to more obvious characters, causes us to place them next to *Bovista*.

1. C. CIRCUMSCISSUM, B. & C. Peridium subglobose, more or less depressed, and often quite irregular; cortex thickish, fragile, usually rough and uneven from the adhering soil, after maturity torn away, leaving the lower two-thirds or more in the ground; inner peridium depressed-globose, subcoriaceous, rather thin, pallid, becoming gray, minutely furfuraceous, with a small regular basal mouth. Mass of spores and capillitium soft, compact, then friable, olivaceous, changing to pale brown; the pieces of the threads short, unequal in length, flexuous, hyaline, 3-4 mic. in thickness; spores globose, minutely warted, 4-5 mic. in diameter, often with a minute pedicel. See Plate V., Figs. 4, 5, 6, 7, 8, 9.

Growing in heavy clay soil in old lanes and pastures, especially along the hard-trodden paths. Maine, *Blake*; Ohio, *Morgan*; Kansas, *Kellerman*; Nebraska, *Webber*. Inner peridium $\frac{1}{2}$ - $\frac{3}{4}$ of an inch in diameter. This is *Bovista circumscissa*, B. & C., of Berkeley's Notices of N. A. Fungi. It grows in great abundance with us some seasons, right in the hard-trodden barnyard, and along the lane to the cattle pasture. *Arachnion album*, Schw., usually keeps it company.

2. C. SUBTERRANEUM, Peck. Peridium subglobose, often irregular; cortex thickly incrustated and browned by the adherent soil, fragile, after maturity torn asunder, leaving much the greater portion in the ground; inner peridium subglobose, somewhat irregular, subcoriaceous, thickish, smooth, whitish, becoming brown, dehiscent within the base by an irregular lacerate aperture. Mass of spores and capillitium soft, compact, then friable, olivaceous, changing to brown; the pieces of the threads short, unequal in length, flexuous, hyaline, 3-4 mic. in thickness; spores globose, distinctly warted, 6-8 mic. in diameter, sessile.

Growing in thick grass in sandy soil. Wisconsin, *Trelease*; Dakota, *Irish*; Colorado, *Webber*. Inner peridium $\frac{1}{2}$ -1 inch in diameter. This is *Bovista subterranea*, Peck, Botanical Gazette, Vol. IV., p. 216. It is readily distinguished from the preceding species by its much larger spores, more distinctly warted.

3. C. PEDICELLATUM, Morg. n. sp. Peridium subglobose, more or less irregular; cortex rather thin, incrustated with soil, fragile, after maturity torn away, leaving the greater part or sometimes the whole in the ground; inner peridium

depressed-globose, subcoriaceous, thinnish, pallid or gray becoming brown, smooth and shining, dehiscent at the base by a small regular mouth. Mass of spores and capillitium soft, compact, then friable, olivaceous, changing to brown; the pieces of the threads short, unequal in length, flexuous, hyaline, 3-4 mic. in thickness; spores globose, distinctly warted, 8-9 mic. in diameter, with a long, persistent hyaline pedicel.

Growing in sandy soil. South Carolina, *Ravenel*. Inner peridium $\frac{3}{4}$ -1 $\frac{1}{4}$ inches in diameter. This was sent to me for *Bovista nigrescens*, but neither threads nor spores would permit such a reference. There are quite likely more species of these curious things in the southern and western sections of the country. George Massee's article on *Bovista*, in the *Journal of Botany*, Vol. XXVI., p. 129, shows there is a considerable number of species elsewhere.

Genus XII.—BOVISTA, Dill.

Mycelium fibrous or sometimes filamentous. Peridium subglobose, without a thickened base; cortex a thin fragile continuous layer, shelling off or disappearing at maturity, except sometimes a small portion about the base; inner peridium thin, membranaceous, becoming papyraceous, dehiscent by an apical mouth or opening irregularly. Capillitium originating within the tissue of the gleba; the threads free, short, several times dichotomously branched, the main stem much thicker than the diameter of the spores, the branches tapering; spores small, globose or oval, even, brown.

Puff balls of small size, growing in fields and woods; they mostly grow above ground, but one is hypogæous. They are specially characterized by the peculiar threads of the capillitium; these originate within the tissue of the gleba along with the spores, and after deliquescence are left wholly free within the peridium. Each thread has a short, thick primary stem, three or four times thicker than the diameter of the spores, which sends out branches in both directions, these again branch several times with constantly diminishing thickness, the ultimate branches tapering to a fine point. The fine slender hyphae, which compose the wall of the inner peridium, and branches of which form a fleecy lining upon its inner surface, do not resemble the capillitium-threads, nor are they connected with them.

a. *Peridium with an irregular lacerate mouth, the spores sessile.*

1. B. PILA, B. & C. Peridium globose or obovoid, with a stout cord-like root. Cortex a thin, white, smooth continuous coat, breaking up at maturity into minute scales, which soon disappear; inner peridium thickish, tough, rigid, becoming brown or purplish-brown, smooth and shining, a long time persistent, and finally, with age, often fading to silvery-gray; dehiscence taking place at length by an irregular torn aperture at or about the apex. Mass of spores and capillitium very firm, compact and persistent, at first clay-colored pale-brown or olivaceous, at length dark or purplish-brown; the threads rather small, .6-.8 mm. in extent, three to five times branched, the main stem 12-15 mic. thick, the ultimate branches rigid, nearly straight, tapering to a fine point; spores globose, even, 4-5 mic. in diameter, sessile or with only a minute pedicel.

Growing on the ground in woods. New England, *Humphrey*; New York, *Peck*; Pennsylvania, *Gentry*; Ohio, *Morgan Wright*; Wisconsin, *Lapham*, *Trelease*; Iowa, *McBride*. Peridium $1\frac{1}{2}$ - $2\frac{1}{2}$ inches in diameter. This *Bovista* is remarkably tough, it maintains its shape firmly and persists a long time; it breaks away from its root and rolls about over the old leaves before the wind even till the following season. There is nothing in the description of *B. stippea*, Berk., to separate it from this species; *B. tabacina*, Sacc, is said to be this same thing. *Mycenastrum Oregonense*, E. & E., was founded on specimens of this puff ball.

2. B. MONTANA, Morg. n. sp. Peridium subglobose with a cord-like root. Cortex a thin white continuous layer, breaking up at maturity into a mealy or furfuraceous coat, which soon falls away; inner peridium thin, flaccid, becoming brown, smooth and shining, dehiscent by an irregular torn aperture about the apex. Mass of spores and capillitium soft, lax, at first ochraceous or pale-brown, finally purplish-brown; the threads curled and flexuous, very large, with an expanse of 1.25-1.75 mm., four to seven times branched, the main stem 15-20 mic. in thickness, the ultimate branches long and tapering; spores globose, even, 4.5-5.5 mic. in diameter, often with a minute pedicel.

Growing on the ground. Rocky Mountains, *Jones*. Peridium $1\frac{1}{2}$ -2 inches in diameter. This differs from the preceding species in being soft, flaccid, and soon collapsing; it, no doubt, is not so persistent. Microscopically it is readily distinguished by its much larger threads. I have no knowledge of *B. obovata*, Masee, described in the Journal of Botany, Vol. XXVI., p. 134, and said to come from New Mexico.

b. Peridium with a regular apical mouth, the spores with long pedicels.

3. *B. NIGRESCENS*, Pers. Peridium subglobose, with a fibrous mycelium. Cortex a thin, smooth, white continuous layer, at maturity breaking up into scales, which soon disappear; inner peridium thin, flaccid, becoming dark-brown, smooth and shining, dehiscent at the apex by a lacerate mouth. Mass of spores and capillitium soft, lax, at first ochraceous or olivaceous, at length purplish-brown; the threads flexuous, about 1 mm. in extent, three to five times branched, the main stem 12-18 mic. thick, the ultimate branches tapering; spores globose or oval, even, 5-6 mic. in diameter, with long hyaline pedicels.

Growing in old pastures, in fields and woods. Canada, *Saccardo*; Pennsylvania, *Schweinitz*; North Carolina, *Curtis*; Ohio, *Lea*; California, *Harkness*. Peridium 1-2 inches in diameter. I have never succeeded in obtaining an American specimen of this species; my description is drawn up from European specimens.

4. *B. PLUMBEA*, Pers. Peridium depressed-globose, with a fibrous mycelium. Cortex a thin, smooth, white continuous coat, loosening at maturity and shelling off, except sometimes a small portion about the base; inner peridium thin, tough, smooth, lead-colored, dehiscent at the apex by a round or oblong aperture. Mass of spores and capillitium soft, lax, ochraceous or olivaceous, then purplish-brown, the threads .8-1.0 mm. in extent, three to five times branched, the main stem 12-16 mic. thick, the ultimate branches long, straight and tapering to a fine point; spores oval, even, 6-7 by 5-6 mic., with long hyaline pedicels.

Growing on the ground in meadows and pastures. New England, *Frost*; New York, *Peck*; Pennsylvania, *Schweinitz*; Carolina, *Curtis*; Ohio, *Morgan*; Indiana, *Gentry*; Wisconsin,

sin, *Trelease*; California, *Harkness*. Peridium $\frac{3}{4}$ – $1\frac{1}{4}$ inches in diameter. I have never seen specimens with globose spores. and probably our plant is referable to *B. ovalispora*, Cke. & Mass. I have described it under the name by which it has always been known in this country.

5. *B. MINOR*, Morg. n. sp. Peridium subglobose, deeply sunk in the soil and connected with it by a filamentous mycelium, which issues from every part of the surface. Cortex thickish, rough and irregular from the adherent soil, fragile, falling away at maturity, except sometimes a small portion about the base; inner peridium thin, smooth, flaccid, reddish-brown, dehiscent by a regular apical mouth. Mass of spores and capillitium olivaceous, then reddish-brown; the threads curled and flexuous, with an expanse of 1.0–1.5 mm., two to four times branched, the main stem 10–15 mic. thick, the ultimate branches very long and tapering to a fine point; spores globose or slightly oval, even, 3.5–4.5 mic. in diameter, with long hyaline pedicels. See Plate V., Figs. 10, 11, 12.

Growing in damp shaded situations. Ohio, *Morgan*; Nebraska, *Webber*. Peridium $\frac{1}{2}$ – $\frac{3}{4}$ of an inch in diameter. A species well marked by its peculiar habit. The curled and flexuous threads are interesting microscopic objects.

Genus XIII.—MYCENASTRUM, Desv.

Mycelium funicular, rooting from the base. Peridium subglobose, without a thickened base; cortex a smooth continuous layer, at first closely adnate to the inner peridium, after maturity gradually breaking up and falling away; inner peridium thick, tough, coriaceous, becoming hard, rigid and corky, the upper part finally breaking up into irregular lobes or fragments. Capillitium originating within the tissue of the gleba; the threads free, short, thick, with a few short branches, acutely pointed and with scattered prickles; spores large, globose, sessile, brown.

Puff balls of considerable size, growing in the sandy soil of dry regions. A very distinct genus, in no way related to *Scleroderma*, and resembling it only in its thick, corky, inner peridium. The threads of the capillitium originate within the tissue of the gleba, along with the spores, and are set free by deliquescence, the same as in *Bovista*.

1. *M. SPINULOSUM*, Peck. Peridium globose, depressed globose, sometimes elongated and often irregular, with a thick, cord-like root. Cortex at first a thickish, white, smooth, continuous layer; after maturity it cracks or becomes furrowed into large polygonal areas, and at length falls away in large flakes or scales; inner peridium very thick, at first white and coriaceous, becoming hard, dry, brown and rigid, the upper part finally breaking up into irregular lobes or fragments. Mass of spores and capillitium compact, then friable, at first olivaceous, then dark purplish-brown; the threads bent, curved and flexuous, subhyaline, .2-.7 mm. in length, about the same thickness as the spores, with a few short branches, and with scattered prickles, which are most abundant toward the acute extremities; spores globose, very minutely warted, opaque, 9-12 mic. in diameter, often with a minute or slender hyaline pedicel. See Plate V., Figs. 13, 14.

Growing on the sandy soil of the western prairies. Wisconsin, *Brown*; Dakota, *Ellis*; Nebraska, *Webber*; Colorado, *Trelease*; Kansas, *Kellerman*, *Cragin*; New Mexico, *Irish*. Peridium 2-4 inches in diameter. The plants are said to grow together in groups, sometimes of many individuals; after maturity they are easily loosened from their place of growth, and are then rolled about by the wind. It has been stated that Prof. Peck's name is a synonym for *M. corium*, Desv., but it is not clear what this species is. In Saccardo's Sylloge the diameter of the spores is given as 8 mic., in Grevillea XVI., p. 33, Dr. Cooke gives their diameter as 15 mic.; neither of these measurements apply to our plant. So far as description goes, our plant appears to be the same as the South American *M. chilense*, Mont. Montagne states that he compared his plant with an authentic specimen of *M. corium* from Desvaux, and that they differed in the color and appearance of the capillitium and mode of branching of the threads. With abundant specimens from widely different regions of the west, I have been unable to detect but this single species.

MANUAL OF THE PALEONTOLOGY OF THE CIN-
CINNATI GROUP.

BY JOSEPH F. JAMES, M. SC., F. G. S. A.

PART II.

(Continued from Vol. xiv, p. 72).

CŒLEENTERATA.

An extensive sub-kingdom, comprising a great variety of forms in both a living and a fossil state; widely scattered over the world and found in all geological formations from the most ancient to the most recent.

It is divided by Nicholson* into two classes, HYDROZOA and ANTHOZOA, and these again are divided into sub-classes. Both classes are represented by fossils in the Cincinnati group.

The CŒLEENTERATA show a considerable advance over the PROTOZOA, there being present a simple or divided cavity, which acts as an alimentary tract, and which is sometimes divided into two parts. The body wall consists of two layers, an "ectoderm" or outer skin, and an "endoderm" or inner skin. Between these, an intermediate layer, "mesoderm," is usually developed.

Thread cells, possessed of peculiar stinging powers, are present. They are provided with long lasso-like filaments, that lie coiled up in the cells when at rest, but are shot out rapidly when a necessity arises for their use. The tip of the lasso is furnished with a number of barbs or hooks, by means of which the "sting" is inflicted. A nervous system is generally developed. Reproductive organs are present, but asexual reproduction, (budding or gemmation) also takes place. (See Nicholson, as above, and T. Rymer Jones, "Animal Kingdom," 4th edition, pp. 57-59, for fuller details.)

*Manual of Paleontology, vol. 1, 1889, pp. 190-191. I am also indebted to this same author for most of the account of the sub-divisions of this sub-kingdom, which follows.

Class.—HYDROZOA.

This class comprises those Cœlenterates in which the walls of the body enclose a simple undivided cavity. No œsophageal tube is present, but the upper end of the alimentary tract may be prolonged into radiating canals united by a peripheral ring. The reproductive organs are external buds, often developed into specially modified zooids. (Nicholson, *Ibid.*, p. 192.)

The simplest living type is the fresh-water *Hydra*. In this, as in all the other members of the class, the ovum gives rise to a "polypite," often capable of throwing out buds. These generally remain attached to the parent "zooid," and a compound organism is produced. Frequently the zooids are differentiated into two sets; the members of one of these supply the food, while the others act as the reproductive bodies of the colony. These last are termed "gonophores," and may remain attached to or become free from the parent. The colonies are either free or attached by a modified end. The ectoderm frequently secretes a chitinous or calcareous outer layer, that may cover only the fleshy stem or "cœnosarc," or be extended into little cups or "hydrothecæ." When these last are present the body of the polypite is contained within the cup, while the tentacles are protruded from the open end.

But few genera of this class are preserved in a fossil state, though great numbers are now found in the oceans. The bodies are generally soft and illy-adapted for preservation; and although certain of these soft bodied animals (*i. e.* *Medusæ* or jellyfish) are supposed to have left impressions on the rocks, generally only those secreting a horny, chitinous or calcareous skeleton have been preserved.

Three sub-classes are represented in the Cincinnati Group in Ohio. These are HYDROIDA, GRAPTOLITOIDEA and STROMATOPOROIDEA. The features of these sub-classes are given under their respective heads.

Sub-class HYDROIDA.

A single order, THECAPHORA, is represented. The general features are: organism attached or at least capable of attachment; branching and plant-like, consisting of numerous

polypites united by a common stem or "cœnosarc;" outer covering chitinous or corneous, investing the cœnosarc, and prolonged into hydrothecæ.

To this order two genera, generally classed under Graptolites, are referred by Nicholson. They are *Dendrograptus* and *Dictyonema*, and are readily distinguished from each other. In the first the stem is branching and plant-like; in the second it forms a reticulated net-work. The two genera differ mainly from the true Graptolites by having a base for attachment, the typical GRAPTOLITOIDEA lacking this.*

Genus 1.—DENDROGRAPTUS, Hall, 1862.

Fronds simple or aggregate, consisting of a strong foot-stalk, sometimes furnished below with a distinct root, or root-like bulb, and above variously ramified and divided into numerous branches and branchlets, slightly divergent; the whole thus appears shrub-like; fronds some times flabellate (?); branches celluliferous on one side; cellules appearing sometimes as simple indentations on the surface, sometimes distinctly angular, with conspicuous denticles; substance of stipe and branches corneous; solid or tubular; surface striated; the denticles are sometimes absent from some branches. (Hall, Geol. of Wisconsin, vol. 1, 1862, name only, p. 21. Grap. of Quebec Group. Can. Organic Remains, Decade II, 1865, p. 126; Nicholson, Mon. of Brit. Graptolitidæ, pt. 1, 1872, p. 127. *Buthotrephis* in part. *Psilophyton* in part.)

Remarks.—This genus was first proposed in the Geology of Wisconsin, as noted above, but it does not seem to have been described until 1865, when the "Graptolites of the Quebec Group" was published. It is probable that the species described by Hall as *Buthotrephis gracilis* is really a graptolite, and there is no doubt in the mind of the writer that *Psilophyton gracillimum*, Lesqx., is really one.

1. D. GRACILLIMUM, Lesqx. (sp.) 1877.

"Stem very slender, dichotomously branched, smooth or naked half round, slightly channeled in the length, branches numerous, of various length, filiform." (Am. Phil. Soc.,

*For numerous references and notes in the portion which follows I am indebted to Dr. R. R. Gurley, of the U. S. Fish Commission. He has been engaged for several years past in the study of the group of Graptolites.

Proc., vol. 17, 1877, p. 164, as *Psilophyllum gracillimum*, Lesqx.)

Locality.—Cincinnati, in bed of Crawfish creek; Kentucky, in bed of Licking river.

Remarks.—The above species was originally described as a land plant belonging to the genus *Psilophyton* of Dawson. It is, however, associated with marine organisms, and can scarcely be considered as of any other than animal origin. Walcott notes this fact in his paper on "Fossils of the Utica Slate" (advance paper of Albany Institute Trans., vol. 10, 1879, p. 21), where he says: "Their occurrence with algæ, graptolites, trilobites and brachiopods in the same layers of shale, in a position indicating their growth *in situ*, taken with their graptolitic structure, precludes the idea of their being of other than marine origin." The specimens as found at Cincinnati are generally greatly broken up, and occur in a soft, blue clay, with stems of crinoids, brachiopoda, etc. The species greatly resembles *D. tenuiramosus* and *D. simplex*, Walc., from the Utica slate, and *D. gracilis* Hall, from the "Quebec" group. A form of *Buthotrephis* (*B. gracilis* Hall) is also very similar to this, and appears to be distinct from other forms referred to the same species. (See Paleontology of N. York, vols. 1 and 2, 1847, 1852).

2. *D. TENUIRAMOSUS*, Walcott, 1879.

Stipe slender, compressed; branches bifurcating irregularly, frequently subdividing, terminating in filiform extremities; surface apparently smooth; celluliferous side with smooth, simple, round pits or depressions along the center of the branches; substance corneous, and probably tubular. (Separate from Trans. Albany Insti., vol. 10, 1879, p. 10).

Locality.—Cincinnati, Ohio.

Remarks.—This species was originally described from the Utica slate of New York, but it also occurs in the Cincinnati group. Ulrich gives its horizon as between low water in the Ohio at Cincinnati and 200 feet above. A specimen in the collection of the late Mr. U. P. James shows all the characters of the species. It is closely related to *D. gracillimum* and occurs at about the same horizon at Cincinnati.

Genus 2.—*DICTYONEMA*, Hall, 1852.

Fronds circular, flabelliform, funnel-shaped or conical, sometimes arranged in groups composed of radiating branches, which frequently divide, but run nearly parallel with one another; all the branches united by delicate transverse bars or dissepiments; cellules forming distinctly angular denticles, arranged on the sides of the branches in an alternate manner; frond rooted (?); substance corneous. (Palentol. of New York, vol. 2, 1852, p. 174. *Emend.*, Nicholson, Mon. Brit. Graptolitidæ, 1872, p. 129.)

Remarks.—The genus was originally described by Prof. Hall as a coral, the type species occurring in the Niagara Group. Prof. Hall noticed its resemblance to the Graptolites, however, and in 1857 referred the genus to that family.* Only a single species has been recorded from the vicinity of Cincinnati. This has been generally referred to as *D. irregulare*, but Dr. Gurley says it is not that species as it occurs in New York. He places it in the species as given below with the accompanying comments.

1.—*D. ARBUSCULUM*, Ulrich (sp.) 1879.

“Frond small, originating in a single stipe at the base, branching and spreading above; branches varying in size, but narrow, not exceeding two-one-hundredths of an inch in width, with strong, prong-like projections rising from the sides at variable intervals; bifurcations numerous; surface with faint longitudinal or diverging corrugations irregularly distributed; free extremities of branches usually pointed. (Jour. Cin. Soc. Nat. Hist., vol. 2, 1879, p. 28; as *Inocaulis arbuscula*.)

“To this description I add the following from an examination of specimens in the cabinet of the late Mr. U. P. James:

“Specimens consisting of a portion of the network, showing it to be formed principally by the curving toward each other of adjacent branches, dissepiments, however, being present. In consequence of the curvilinear direction of the branches the meshes have a rounded-oblong, or rounded-diamond shape. Branches varying in thickness, but about two-

*In the Rept. Prog. Can. Surv., 1857, p. 142, where *Graptopora*, Salter was noted as a synonym. Hall also records the discovery of hydrothecæ (“cellules”) and modifies the original description to include these. (R. R. G.)

one-hundredths of an inch or more. Length several times the breadth, so that the spaces are frequently long and narrow.

"*Locality*.—Covington, Ky., 150 feet above low water in the Ohio River; run emptying into the Little Miami River, near Symmes Station, on the Cincinnati, Washington and Baltimore R. R.

"*Remarks*.—Mr. Ulrich informs me that a study of better material than that upon which his original description was based has convinced him of the identity of three species enumerated in his 'Catalogue of Fossils occurring in the Cincinnati Group,' 1880, p. 6. These are *D. irregulare*, Hall (U. P. James), *Dictyograptus reticulatus*, Ulrich, (named, but not described) and *Inocaulis arbuscula*, Ulrich.

"In the cabinet of the late Mr. U. P. James are two specimens identified by him as *D. irregulare*, Hall. A comparison of these with Mr. Ulrich's figure of *Inocaulis arbuscula* seems to rather favor his views of the identity of the two forms. I may also add that the species is undoubtedly a *Dictyonema*, and it is distinct from the Calciferous form. Specimens of the latter from the type locality show the branches more angularly bent, so the meshes are more nearly rectangular; whereas in the present form the branches are more slender and more roundly curving, thus making the interspaces rounded diamond shape."

In the original description Mr. Ulrich compares his species to *Inocaulis bellus*, H. & W., from the Niagara. J. W. Spencer says (Bull. Mus. Univ., Missouri, No. 1, 1884, p. 13) that it "resembles and is probably a species of *Calyptograptus*," a new genus proposed by himself (Can. Nat., new ser., vol. 8, 1878).

The original description of *D. irregulare*, Hall, is as follows: "Frond spreading, diffuse, branches lax, frequently bifurcating; bifurcations unequal; branches equal to one-half the usual width of the interspaces, or a little less; connecting filaments generally slender, expanding with their junction with the branches. Fenestrules extremely irregular in form and proportions, varying from a width greater than the length, to a length three or four times as great as the width; those with a length and breadth nearly equal, often appear hexagonal. Near the base of the frond the fenestrules are sometimes elongate and triangular. Cellules undetermined.

Surface without distinct organic markings. Branches arranged in the proportion of from 25 to 28 in the space of an inch." (Canadian Organic Remains, Decade II, 1865, p. 136).

Sub-class GRAPTOLITOIDEA.

Hydrozoa, in which the hydrosoma is compound and free, consisting of numerous polypites united by a cœnosarc, the latter being enclosed in a strong tubular polypary, while the former are protected by hydrothecæ. The polypites not separated from the cœnosarc by any partition, and the polypary generally supported by a chitinous rod or solid axis. (Nicholson, Monograph Brit. Grapto., 1872, p. 99. See also for a full explanation of the features of various members of the sub-order, Manual of Paleontology, Nicholson, vol. 1, 1889, pp. 210-222).

Remarks.—In this sub-class are included the majority of the Graptolites. The limited number of species known from Cincinnati scarcely justifies an elaborate classification, but the key presented below is perhaps as natural a one as can be given with our present knowledge of the more obscure forms.

Key to Genera.

a. MONOPRIONIDÆ—*i. e.*, polypary with cells on one side only.

1. Graptolithus—Polypary simple and unbranched.

b. DIPRIONIDÆ—*i. e.*, polypary with cells on both sides.

2. Diplograptus—Cell mouths at the end of projecting denticles.

3. Climacograptus—Cell mouths apparently sunk beneath the substance of the stipe.

4. Dicranograptus—Cell mouths as in No. 3; the main stem with cells on both sides; the branches with cells on one side only.

c. MULTIPRIONIDÆ—*i. e.*, with many cells, without definite arrangement.

5. Megalograptus—Cell scattered over polypary, but not on margin.

d. INSERTÆ SEDIS—*i. e.*, of uncertain position.

6. Inocaulis—Cells unknown; branched and rough, generally in groups.

7. Dawsonia—Polypary unknown; ovoid bodies supposed to be ovarian capsules.

Genus I.—GRAPTOLITHUS, Linn, 1768.

Polypary simple, linear, commencing with a more or less attenuated, generally curved base, and possessing only a single row of cellules on one side; the cellules generally overlap to a greater or less extent, and are never separated by non-polypiferous portions of common canal. (Emend, Nicholson, Mon. Brit. Grap., 1872, p. 101, as *Graptolites*).

Remarks.—Nicholson notes that the above definition does not correspond to the original one of Linnæus, nor to the later definition of Hall. It is made to include, however, those forms that in an adult condition have only a single row of cellules on one side. The two species commonly referred to this genus from the Cincinnati group are *G. gracilis* and *G. subtenuis*. As regards the genus itself Dr. Gurley says:

"*Graptolithus* has practically been abandoned; because, first, it was established for, and as at first defined included, only *inorganic* objects (*Dendrites*, etc.), and second, it has been used for everything until it now means nothing. When used at all by the latest writers, it is in the sense of the *exclusively* Upper Silurian *Monograptus*."

In regard to the form identified as *G. gracilis*, from Cincinnati, Dr. Gurley says: "So far as can be determined from the material I have seen, the specimens identified as *Graptolithus gracilis*, Hall, and *Dendrograptus gracillimum*, Lesqx., seem much alike. I judge, however, from single specimens of each, and these leave much to be desired. The only criteria are the thickness and general aspect of the branches, which seem much the same. This *gracilis* bears no relation to *Stephanograptus gracilis*, from Norman's Kill, New York, which is the only '*Graptolithus gracilis*' Hall described. Better specimens might show different features, but probably that called *G. gracilis* is *Dendrograptus gracillimum*, Lesqx. *Dendrograptus gracilis*, Hall, is, I think, Calciferous, which is strong presumptive evidence against the reference of the Cincinnati form to that species."

In regard to *G. subtenuis*, Hall, and *G. tenuis*, Portlock, Dr. Gurley writes: "Portlock's species is *Monograptus tenuis* of the Upper Silurian. To it has been referred almost every species which was slender and had the thecæ confined to one side. The American species that has been referred to it is

Leptograptus (*Graptolithus*) *sub-tenuis*, Hall (sp). This is a Norman's Kill, New York, form, and I should doubt very strongly its presence in the Cincinnati group. There can be no question whatever as to the distinctness of Portlock's and Hall's species, and I strongly suspect the Cincinnati form is referable to neither."

Upon this authority, therefore, what has been called at Cincinnati *G. gracilis* is referred to *Dendrograptus gracillimum*, (which see *ante*); and *G. sub-tenuis* is dropped altogether.

Genus 2.—DIPLOGRAPTUS, McCoy, 1854.

Polypary composed of two simple, monoprionidian stipes, united back to back, their dorsal walls uniting to form a median septum, along the center of which runs the solid axis; cellules alternating with one another on the two sides of the frond, the cell mouths being situated at the end of projecting denticles; base usually furnished with a radicle, and the solid axis probably always prolonged beyond the distal end of the polypary. (Nicholson, Mon. Brit. Grap., 1872, p. 115).

Remarks.—McCoy's original description of this genus consists of the statement that he restricts *Graptolithus* to those species having cells only on one side. For those with cells on both sides he proposed *Diplograpsus* [now *Diplograptus*]. (Brit. Pal. Foss., 1854, p. 3).

Of the two species commonly referred here, one (*spinulosus*) has been placed in the genus *Glossograptus*. The other (*Whitfieldi*) remains with the genus. Both are, however, here retained in *Diplograptus*, as I can not see the justice of separating the two species. *Glossograptus* was defined as follows: "Column free; thin membranaceous, ligulate, extremities rounded, axis distinct." (Emmons, Amer. Geology, pt. 2, 1856, p. 108).

1.—D. SPINULOSUS, Hall, 1859.

Stipe simple, flat; sides sub-parallel, gradually expanding from the base, which is furnished with several minute setiform radicles; serratures not distinct, the margins sinuous; the principal parts extended into slender, spiniform processes. These spinules are about one-sixteenth of an inch apart. (Paleont. of New York, vol. 3, 1859, p. 517.)

Locality.—Cincinnati, O.

Remarks.—Dr. Gurley remarks that this species is doubtfully distinct from *Glossograptus ciliatus*, Emmons. The description of the latter species is as follows: "Straight linear crenulations faintly developed and prolonged into ciliæ, equal in length to the width of the ligulate body; ciliæ surrounding the whole body or membrane. The axis is prolonged beyond the membrane, forming the column or stem. Length one inch." (Emmons, *loc. cit.*, p. 108).

2.—D. WHITFIELDI, Hall, 1859.

Stipe simple, flat, gradually expanding from the base to near the middle of its length, the upper part gradually narrowing in the direction of the apex, rarely continuing of the same width above the middle; serratures shallow, angular; the upper margin of the denticle short and nearly rectangular to the axis, the lower side twice as long as the upper, the tips furnished with mucronate or short setiform extensions which project in a line with the upper margin of the denticle. Serratures from 22 to 28 in one inch. Length one to one and a half inches. (Paleont. of New York, vol. 3, 1859, p. 516).

Locality.—Cincinnati.

Remarks.—Dr. Gurley says the occurrence of this species at Cincinnati is doubtful, as it, like the previous one, is a "sub-Utica" form in New York. It is also possible, he thinks, that both may be errors for *quadrimucronatus*, Hall, a "Utica" species.

Genus 3.—CLIMACOGRAPTUS, Hall, 1865.

Polypary composed of two simple, monoprionidian stipes united back to back, their dorsal walls coalescing to form a median septum, in the center of which runs a solid axis, the cellules so welded together that their mouths appear as if sunk below the general surface of the polypary; solid axis prolonged beyond the distal extremity of the frond, and usually beyond its proximal extremity as well. (Hall, Grap. Quebec Group. Can. Organic Remains, Decade II, 1867, p. 111. Nicholson, *loc. cit.*, 1872, p. 117).

Remarks.—Though originally described by Hall, the above description is that given by Nicholson. It differs somewhat in terminology from Hall's description, but the characters are the same. Two species of the genus have generally been

credited to the Cincinnati rocks. *C. bicornis* and *C. typicalis*. Dr. Gurley informs me that in New York the former very rarely ranges above the lower Trenton, and that probably the Cincinnati forms heretofore referred to this species should be called *C. typicalis*. The two descriptions are, however, inserted here for comparison.

1.—*C. BICORNIS*, Hall, 1847.

Stipe linear, elongated, compressed, narrow, gradually widening from the base upwards; one line or less wide; serrated on both sides; serratures slightly oblique; teeth about one-half the width of the stipe, obtuse; axis capillary; base bifurcate, slit extending about one-half way to the axis; about one-half as thick as wide, round on one side, flat on the other, often covered with carbonaceous material. (Pal. of New York, vol. 1, 1847, p. 268, as *Graptolithus bicornis*).

Locality.—Cincinnati (?).

Remarks.—For remarks on this species see under the generic description above.

2.—*C. TYPICALIS*, Hall, 1865.

Stipe linear, serrated on both sides; orifices sunk beneath the surface of the polypary, transversely oval, or, when flattened, rectangular or slightly oblique and semi-oval; axis filiform, central or sub-central and apparently solid; cellules joined to the axis at the base, the cell partitions consisting of triangular plates, with an unequal arching or convex upper surface, and a concave lower surface; at the base of the cellules and along the entire length of the stipe is a longitudinal depressed line.

Locality.—Cincinnati.

Remarks.—This species, while named by Hall in 1865 in Canadian Organic Remains, (Grap., of Quebec Group,) 1865, p. 57, and explanation of plate A, is not expressly defined by him. Consequently the description above given has been compiled from remarks made in the course of the discussion of *C. bicornis* on pages 29–30. On plate A nine figures of the species are given. Nicholson rather questions the absence of a vertical septum in this species, saying it is certainly present in the type species of the genus, and in all others examined

by him. "If it should be proved," he says, "that such a vertical septum is truly wanting in *C. typicalis*, Hall, a new genus must, I think, be established for its reception." (See Mon. Brit. Grap., 1872, p. 118).

Genus 4.—DICRANOGRAPTUS, Hall, 1865.

Polypary having its proximal portion diprionidian, but dividing distally into two monoprionidian branches, which have cellules on their outer aspect only; cellules so welded together that their mouths appear as if sunk below the general surface of the polypary; solid axis prolonged proximally as a minute radicle, flanked by two minute lateral spines. (Nicholson, Brit. Grap. *loc. cit.*, p. 119).

Remarks.—In this case, as with *Climacograptus typicalis*, no definite description is given by Hall on the original proposal as the name. (Canadian Organic Remains; Grap. of Quebec Group, 1865, p. 112). The description given above is, therefore, taken from Nicholson's Monograph. But one species has been recorded from the Cincinnati group, given below.

1.—D. RAMOSUS, Hall, 1847.

Stipe linear, narrow, about one line wide, compressed, serrated on both sides, except branches; teeth obtuse, distant, somewhat narrowed toward the base, more than one-half the width of the stipe; stipe bifurcating or ramose; branches linear, serrated only on outer margin. (Pal. of New York, vol. 1, 1847, p. 270, as *Graptolithus ramosus*).

Locality.—Cincinnati.

Remarks.—This species, under the name of *Graptolithus ramosus*, is frequently mentioned in Hall's "Graptolites of the Quebec Group." Nicholson also refers to it (Mon. Brit. Grap., 1872), and gives an excellent figure.

Genus 5.—MEGALOGRAPTUS, S. A. Miller, 1874.

Stipe large, cylindrical or sub-cylindrical; surface covered with cells; fronds with spinous processes on the margins; carbonaceous film covering one side. (Cin. Quart. Jour. Science, vol. 1, 1874, p. 343).

Remarks.—This is quite an anomalous genus, being entirely distinct from any other known graptolite. Its position in any system of classification is as yet undetermined. Only one species is known.

1.—*M. WELCHI*, Miller, 1874.

Surface of polypary smooth, mostly covered with cells immersed in the body of the frond; openings circular, about one thirty-second of an inch in diameter and one-sixteenth of an inch apart; cellules not extending to the edge of the polypary, but ceasing about one-quarter of an inch from the edge; numerous spines borne on the edges of the frond, varying from one-quarter to one-half an inch in length, sharp and sometimes branched; frond divided into sections by transverse constrictions, each section bearing from two to four spines; spines probably originally round, but flattened by compression; whole surface, when well preserved, covered by a black, carbonaceous film, the cell openings only lacking this. (Ibid, pp. 343-346).

Locality.—Clarksville, Clinton County, Ohio.

Remarks.—As noted above, there is only one species in this genus. No one has written upon it except Mr. Miller. In his "North American Geology and Palæontology" (1889), his original figures are reproduced, but no new information is given.

Genus 6.—*INOCAULIS*, Hall, 1852.

Frond composed of numerous flattened, corneous or scabrous bifurcating stems, having a fibrous or plumose structure. (Pal. of N. Y., vol. 2, 1852, p. 176).

Remarks.—This is also an anomalous genus, and its position in the order is very uncertain. No cellules are known in any species referred to it. In a previous paper (Fucoids of the Cincinnati Group, this JOURNAL, vol. 7, p. 164), by the writer, it is suggested that a form described by Miller and Dyer as *Licrophycus flabellum* should be referred to the present genus. It is evident, however, that this was an error. The species in question is more likely the burrow of an annelid. Only one species has been referred to this genus from the Cincinnati group. It is here referred to the genus *Dictyonema* as *D. arbusculum*, which see (ante).

Genus 7.—*DAWSONIA*, Nicholson, 1873.

Horny or chitinous capsules of a rounded, oval, conical, or campanulate shape, furnished in most cases with a little spine or mucro, and having a marginal filament exactly resembling the solid axis of a graptolite. The marginal fiber sometimes complete, sometimes ruptured opposite to the mucro. The mucro sometimes apparently wanting, sometimes marginal, sub-marginal, sub-central or central. The surface smooth or concentrically striated. (Annals and Mag. Nat. Hist., 4th ser., vol. 11, 1873, p. 139). *Lockeia*, U. P. James. The Paleontologist, 1879.

Remarks.—The above name was proposed by Dr. Nicholson for certain bodies found associated with graptolites in Scotland and in Canada, which he considered the ovarian capsules of graptolites of different species. The generic name, *Lockeia*, was proposed for similarly shaped bodies found at Cincinnati, and supposed to be the remains of marine plants. There can be no question that the bodies under consideration are not plant remains. Their resemblance to figures and descriptions of *Dawsonia* cause them to be considered as synonymous with that genus. I find, however, that in 1868, Dr. Dawson refers as follows to a species of trilobite. After describing *Microdiscus dawsoni*, Hartt, he says: "Mr. Hartt had originally described this species under the new generic name of *Dawsonia*, but Mr. Billings regards it as a species of *Microdiscus* of Salter." (Acadian Geology, 1868, p. 655). Whether under these circumstances the name *Dawsonia* was pre-occupied by Hartt is a question to be decided by others. In case it be decided in the affirmative, it is evident that *Lockeia* must be used. For the present we shall use *Dawsonia*, Nicholson. The description of *Lockeia* is as follows: Elongated, convex, obtuse or sharp-pointed bodies, seed-like in appearance, slightly attached to the surface of the rock, with or without a longitudinal depression. (The Paleontologist, 1879, p. 17). Only one species is known from these rocks, as given below.

D. SILIQUARIA, U. P. James (sp.) 1879.

Convex, elongated elevations from one-eighth to one-half an inch long, one-half to one and one-half lines broad at base, and one-half to one line high in center; sloping and tapering

to sharp or more or less obtuse ends; rounded or sharply ridged longitudinally; scattered over the surface of the rock

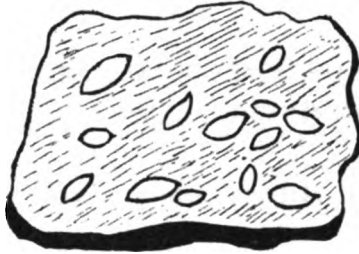


FIG. 7.—*Dawsonia* (*Lockeia*) *siliquaria*. Nat. size. (Original.)

irregularly, sometimes in the form of a star, one in the center and five others placed quite regularly around it with their longer axis pointing inward; again they lie in groups or overlie one another: The specimens have been likened to grains of wheat.

Locality.—Ohio River bank, near Ludlow, Ky., between low and high-water mark.

Remarks.—Placing these bodies with graptolites is, of course, purely conjectural. They do not present any carbonaceous appearance, but from their resemblance to some forms of *Dawsonia*, it seems evident that they belong to that genus, whatever place it may be considered to occupy.

[TO BE CONTINUED.]

DESCRIPTION OF SOME SUBCARBONIFEROUS AND
CARBONIFEROUS CEPHALOPODA.

BY S. A. MILLER AND CHARLES FABER.

(Presented January 5, 1892.)

GONIATITES MISSOURIENSIS, n. sp.

Plate 6, Fig. 1, side view, natural size.

Shell medium size, subglobose, rounded on the dorsum. Umbilicus large, abrupt, deep and showing very little of the inner whorls. Volutions few, increasing rather rapidly in size, broadly rounded upon the sides of the inner whorls, but more and more flattened laterally as the body chamber is approached; transverse diameter of the inner whorls equal to or greater than the width from the dorsal to the ventral side, but near the aperture the dorso-ventral diameter is twice as great as the transverse. Volutions profoundly grooved within for the reception of the inner whorls. Our specimen reveals only the septate portion, and hence the body chamber and aperture are unknown.

Septa close, fairly crowded and deeply sinuous. There are three lobes and three saddles on each side. The saddles are linguiform, being regularly rounded, at the ends, and the superior ones being longer than the inferior ones or those nearer the umbilicus. The lobes are lanceolate, as long as the saddles, and sharply pointed at the extremities, which hug closely the saddles on the superior side. Dorsal lobe and saddle not determined.

The general form, closely crowded septa, and direction of the extremities of the lobes toward the superior saddles will distinguish this species from all others.

Found on Brush Creek, in the Upper Coal Measures, near Kansas City, Missouri, and now in the collection of Charles Faber.

GONIATITES SCIOTOENSIS, n. sp.

Plate 6, Fig. 2, side view, natural size; Fig. 3, dorsal view with anterior end turned downward, and showing radiating furrows curving backward over the dorsum.

Shell medium, or rather above medium size; somewhat lenticular in form, obtusely rounded on the dorsum. Umbilicus consisting of a shallow, funnel-shaped fossette, without exposing any of the volutions. Volutions few, rapidly enlarging the outer ones profoundly grooved for the reception of the inner ones, and depressed convex on the sides. The greatest transverse diameter is at the margin of the umbilical fossette, and it is about two-thirds the dorso-ventral diameter. Seven furrows radiate from the margin of the umbilicus on each side, curve gently forward at the superior lateral sides and then curve more abruptly backward across the dorsum, as shown in our specimen. Probably, if the specimen was perfectly preserved, it would show eight of these radiating furrows. Surface between the furrows showing traces of finer similarly sinuous lines. Body chamber and aperture unknown.

The sinuosities of the septa, as near as they can be determined from our specimen, may be described as follows: Dorsal lobe lanceolate and pointed, superior lateral lobes longer than the dorsal, and pointed at the extremities; dorsal saddle sublinguiform, gradually narrowing and rounded at the extremity, lateral saddles similar in outline, the three inferior lobes short with corresponding saddles.

The lenticular form, funnel-shaped umbilical fossette, and the surface markings, including the radiating furrows, will distinguish this from all other species.

Found above Sciotoville, on the Ohio River, in rocks usually classed with the Waverly Group, but they are above the Waverly sandstone proper, and probably belong to the upper part of the Subcarboniferous system. The specimen described belongs to the collection of Charles Faber.

GONIATITES OCCIDENTALIS, n. sp.

Plate 6, Fig. 6, lateral view, natural size; Fig. 7, dorsal view, showing end of siphuncle at the upper margin and two spots where it is broken into on the dorsum, a radiating furrow and the outlines of two septa crossing the dorsum.

Shell below medium size, globose, broadly rounded on the dorsum, or rather semi-circular from the margin of the umbilicus on one side to the margin of the umbilicus on the other. Umbilicus large, abrupt, deep, exposing very little of the inner whorls. Volutions very gradually enlarging, the outer ones profoundly grooved for the reception of the inner ones; transverse diameter one half greater than the dorso-ventral diameter. Four broad, shallow, indistinctly defined furrows radiate from the umbilicus and pass straight across the dorsum. Surface between the furrows marked with fine transverse lines, and having the border of the umbilicus crenated or subnodose. Siphuncle small and close to the shell on the outer margin. Body chamber and aperture unknown.

Septa form a sigmoidal flexure in crossing the dorsum, with a single angular lateral lobe.

The general form, surface markings, including the radiating furrows, and sigmoidal flexure of the septa on the dorsum, will distinguish this from all other species.

Found in the Coal Measures, on Elkhorn Creek, Kentucky, and now in the collection of Charles Faber.

GONIATITES LIMATUS, n. sp.

Plate 6, Fig. 8, lateral view, natural size; Fig. 9, dorsal view, the fracture at the end destroys the saddles and lobes, leaving only the three inferior indentations.

Shell small, elegant, thin, discoidal, rapidly expanding in circumference, with very slight increase in thickness; sides flat and dorsum narrowly rounded. Umbilicus small, abrupt, exposing very little of the inner whorls. Volutions rapidly expanding dorso-ventrally with very little increase transversely; the outer ones fully embracing the inner ones, flattened on the sides from the umbilicus to the middle of the superior lateral saddles, from which a flat depression extends

to the margin of the rounded dorsum. Our specimen shows only the septate portion, and hence the body chamber and aperture are unknown.

Septa very close, crowded, sinuous. Dorsal lobe narrow, twice as long as wide, linguiform; dorsal saddles a little wider than the dorsal lobe, quite as long, linguiform; superior lateral saddle broader than the dorsal, gradually contracting and rounded at the extremity; lateral lobe obtusely angular.

The thin, discoidal, flattened form, depression at the superior lateral saddles, and sinuosities of the septa will distinguish this from all other described species.

Found in the St. Louis Group, at Crab Orchard, Kentucky, and now in the collection of Charles Faber.

GONIATITES LEVICULUS, n. sp.

Plate 6, Fig. 10, lateral view, natural size; Fig. 11, dorsal view, showing the septa on the dorsum and an end view.

Shell very small, discoid, broadly rounded on the side and dorsum forming about half an ellipse from the margin of the umbilicus on one side to the margin of the umbilicus on the other, and consisting of many volutions. Umbilicus large, abrupt, deep or open, and exposing very little of the inner whorls. Volutions numerous (four are visible in the specimen illustrated, and as many are seen in a much smaller specimen), very slowly enlarging, the outer ones profoundly furrowed for the reception of the inner ones; transverse diameter of the inner whorls greater than the dorso-ventral, but toward the aperture the dorso-ventral diameter exceeds the transverse. Our specimens show only the septate portion of the shell, and consequently the body chamber and aperture are unknown.

Septa close and moderately sinuous. Dorsal lobe about as wide as long, and arcuate at the extremity; dorsal saddles rather narrower than the dorsal lobe and sublinguiform, but spreading over the lateral borders; lateral lobe very obtuse, the septa in a side view being somewhat sigmoidal.

The form, great number of volutions, and character of the septa, will distinguish this from all other described species.

Found in the St. Louis Group, at Crab Orchard, Kentucky, and now in the collection of Charles Faber.

TREMATOCERAS OHIOENSE, n. sp.

Plate 6, Fig. 4, lateral view, natural size; Fig. 5, dorsal view, looking forward.

Shell medium or below medium size, discoidal, rather rapidly enlarging. Umbilicus broad, showing all the inner whorls and perforated in the middle. Volutions gradually increasing in size, coming in contact, without embracing, broader transversely than dorso-ventrally. The sides of the volutions are narrowly rounded, the dorsum bears a wide depressed convex keel in the central part, with a depressed sulcus or concave furrow on each side, bounded laterally by an obtuse angle. Surface ornamented with fine longitudinal lines.

Septa moderately concave and distant nearly one-fourth the transverse diameter; they arch backward in crossing the dorso-lateral furrows and slightly forward in ascending the median ridge, which they cross transversely without extending as far forward as they do on the sides of the volution. Body chamber long, continuing to gradually enlarge and bearing the dorsal keel and furrows. Aperture and siphuncle unknown.

This species most resembles *T. trisulcatus*, from which it is distinguished by being proportionally wider, transversely, more narrowly rounded on the sides of the volutions, shallower dorso-lateral furrows, and convex instead of furrowed median keel; neither do the septa extend as far forward in crossing the median dorsal ridge.

Found near Sciotoville and near the top of the hill, in rocks usually classed with the Waverly Group, but they are above the Waverly sandstone proper, and belong to the upper part of the Subcarboniferous system. The specimens examined belong to the collection of Charles Faber.

CONTRIBUTIONS TO INDIANA HERPETOLOGY.

No. 3.

BY AMOS W. BUTLER.

URODELA—THE SALAMANDERS.

GENUS CRYPTOBRANCHUS, LEUCKART.

1. *Cryptobranchus allegheniensis*, Daudin. HELLBENDER; MUD DEVIL. Only two published accounts of the occurrence of this species in the State have appeared, and they both upon the same authority. Both Mr. Hughes and Prof. Hay give it upon the authority of Mr. E. R. Quick (Bull. Brookville Soc. Nat. Hist., No. 2, p. 44, and this JOURNAL, 1887, p. 60). At the time Mr. Quick gave the information upon which these notes were based, he had seen no specimens for some years. In May, 1888, he brought me a specimen of this Amphibian, which is now in my collection. This specimen was caught on a hook by Mr. H. Kohlbran, about one mile south of Brookville, on the night of May 5th. On the same day another was caught about a mile further down the river. I am confident that in 1877 there were at least two of these animals in the collection of Hanover College, and Prof. A. H. Young informs me that he thought there was such a specimen, but has failed to find it. He stated, however, that he caught a specimen of this species at Hanover Landing, on the Ohio River, in August, 1886.

GENUS AMBLYSTOMA, TSCHUDI.

2. *Amblystoma punctatum*, L. SPOTTED SALAMANDER. A specimen from Richmond, Wayne County, is in Purdue University collection (No. 269).

3. *Amblystoma jeffersonianum*, Green. JEFFERSON'S SALAMANDER. Rather common in the western part of Franklin County. Mr. W. P. Shannon has taken it in Decatur County.

5. *Amblystoma jeffersonianum fuscum*, Hallow. BROWN SALAMANDER, Found with the preceding among the highlands in the western part of Franklin County.

GENUS PLETHODON, TSCHUDI.

5. *Plethodon cinereus*, Green. CINEREUS SALAMANDER; ASHY LIZARD. The Winter of 1888-9 Mr. E. R. Quick brought to me a specimen of this Salamander from a spring house near Brookville.

6. *Plethodon cinereus erythronotus*, Green. RED-BACKED SALAMANDER; CHESTNUT-BACKED LIZARD. Very common in Franklin County and throughout the White Water Valley generally, where it is found in damp places, away from water, beneath logs, stones and other cover.

7. *Plethodon cinereus dorsalis*, Baird. ASHY LIZARD. A specimen from Bloomington, Ind., seems to be this species. (Coll. Indiana University).

GENUS GYRINOPHILUS, COPE.

8. *Gyrinophilus maculicaudus*, Cope. SPOTTED-TAILED SALAMANDER. This species was described by Prof. E. D. Cope in "The American Naturalist," for October, 1890, pp. 966 and 967. It is thought by some to be uncertain that this is *Gyrinophilus*, but I have preferred, for the present, so to regard it. It is a peculiar form, in several respects approaching *Spelerpes longicaudus*, and in others differing much therefrom. In 1888, at the annual meeting of the Indiana Academy of Science, the writer had occasion to speak concerning this Salamander as follows:

"It is desirable that a good series of specimens of Cave Salamanders be obtained as soon as possible, in order that the relationship of the individuals found within our State may be determined. So far as I have learned, those of the western part of the State appear to be typical *longicaudus*. But one of this kind has been found in the southeastern part of the State. The specimens from that region have the form of *longicaudus*, but instead of the lemon-yellow coloring of that form approach the reddish appearance of *ruber*, but lack the peculiar form of the latter."

At the time of a visit made by Prof. Cope to Brookville, following the meeting of the American Association for the

Advancement of Science at Indianapolis, in August, 1890, I spoke to him of the peculiarities of a form of Cave Salamander found near Brookville. They had been called *Spelerpes longicaudus*, but I was satisfied they were not that form, yet I could not satisfy myself as to their identification. He expressed a desire to see one alive, since I spoke of their bright color in life. Through the kindness of Mr. Bayard Quick, he was presented with two living specimens, and I was enabled to furnish him an alcoholic specimen from my collection. These he took with him to Philadelphia. I take the liberty of presenting Prof. Cope's remarks concerning these specimens entire, since it may be possible some, to whom this paper will come and who are interested, may not have seen the paper quoted: "The three specimens represent young, middle-aged and mature individuals, which have passed their metamorphosis. They agree nearly in their characters. They belong to a species which resembles the *Spelerpes longicaudus*, but are distinct in form, color and habits, and belong, moreover, to the genus *Gyrinophilus*. The premaxillary bones are of feeble structure, and the spines are distinct and widely separated, contrary to the structure of the genus *Spelerpes*. The mature individuals, of which Mr. Butler possesses several, are much more robust than those of *S. longicaudus*, having a short body and relatively long preaxillary region and head. With this the tail is as long as in the *S. longicaudus*, and is similarly compressed. The entire animal is larger. The color is different from that of the *S. longicaudus*. It is vermilion-red, as in *S. ruber*, and the superior surfaces of the head and body are irregularly spotted with dark brown. The sides of the tail are similarly irregularly brown-spotted, the spots not showing the least tendency to form the vertical bars characteristic of the *S. longicaudus*. The form of the series of vomerine teeth is different. Instead of commencing at the posterior border of the internal nares, they commence opposite to the anterior border of the same, and send posteriorly a short branch along the internal border of the choana, thus giving a hook-shaped outline to each series. The proportions are as follows:

"Width of head five times in length of head and body to groin. Tail one and a half times the length of the head and body. When the limbs are extended, the posterior toes reach

the distal extremities of the metacarpals. Thirteen costal folds. The width of the head is half the length to above the middle of the humerus. The canthus rostralis is distinct, though not so strongly marked as in *Gyrinophilus porphyriticus*. Total length, 152 mm.; length to angle of mouth, 8 mm.; to axilla, 23 mm.; to groin, 53 mm.; to extremity of vent, 62 mm.

"In the adult specimens the subnareal processes are quite prominent. In young specimens the ground-color is yellower than in those of medium and full size.

"I propose to call this species *Gyrinophilus maculicaudus*. In its habitat in cold springs, it resembles *Spelerpes ruber*, with which it agrees in color. The *S. longicaudus* is a terrestrial species. The first specimens of *G. maculicaudus* were found by Mr. E. R. Quick, of Brookville, Indiana."

This species is only known from Franklin County, in the vicinity of Brookville, and from the northeastern part of the county, also from some caves in the neighborhood of Westport, Decatur County, where Mr. Edw. Hughes obtained several specimens, which are now in the collection of the Brookville Society of Natural History. It is possible that two specimens from Cincinnati, donated by Mr. J. N. B. Scarborough to the Smithsonian Institution (Nos. 8,818 and 8,841), and identified as *Spelerpes ruber* is this species, also that a specimen from Columbus, O., donated by the late Prof. L. Lesquereaux, (No. 3,872) should be referred to this form.

The only other species of *Gyrinophilus* is *G. porphyriticus*, Green. It seems to range throughout the Allegheny Mountain region. Its nearest approach to us is Columbus, Ohio, where Prof. Lesquereaux obtained a specimen.

Since writing the above I find, in the American Naturalist for December, 1891, pp. 1133-1135, an article by Prof. O. P. Hay, entitled, "Note on *Gyrinophilus maculicaudus*, Cope," which, since it relates to the subject under consideration, I take the opportunity to insert here.

"In the year 1889, Mr. A. W. Butler, of Brookville, Indiana, presented to Prof. E. D. Cope some specimens of a tailed batrachian that had been taken near the town named, in Southeastern Indiana. They had been collected, I believe, by Mr. E. W. (R.) Quick, and had been suspected by both Mr. Butler and Mr. Quick to be an undescribed species related to

Spelerpes longicaudus, which they greatly resembled. Prof. Cope's practiced eye immediately perceived that they were not members of the species named, and the results of his examination of the specimens were published in the American Naturalist, Vol. XXIV., page 967. Prof. Cope named the species *Gyrinophilus-maculicaudus*, assigning it to this genus because he found the premaxillaries distinct, instead of being anchylosed, as they are in *Spelerpes*. The species is otherwise distinguished from *Spelerpes longicaudus* by having a broader, flatter head; differently disposed vomerine teeth; by a ground color of vermilion; and by a different arrangement of the black spots. The limbs are also longer than those of *S. longicaudus*. I have had opportunities to examine several specimens, both living and alcoholic, of this beautiful species. Some of these have come to me from Brookville, through the kindness of Messrs. Butler and Quick. Two others had been taken in the vicinity of Bloomington, Indiana, by Prof. B. W. Evermann, of the State Normal School. After making a careful examination of the premaxillaries of several specimens of *maculicaudus* and comparing them with those of *longicaudus*, I am compelled to differ from Prof. Cope as to the generic position of this animal. In the case of all the specimens that I have dissected, except one, I find the premaxillaries to be consolidated. I have taken the premaxillaries out, dried them, and examined them with a sufficiently high power of the compound microscope, without perceiving any evidences of a suture between them. I can see but slight differences between the premaxillaries of it and *S. longicaudus*. In *Gyrinophilus* the premaxillaries are easily separated. In the case of the exceptional specimen mentioned above, the premaxillaries had been broken by accident just a little to one side of the middle line. Had the fracture been exactly in the middle line, I should have concluded that in this specimen the two bones had not united. This suggests that possibly an accident had happened to the specimen examined by Prof. Cope. If, however, Prof. Cope's specimen really had the premaxillaries distinct, while in mine they are anchylosed, the genus *Gyrinophilus* can not stand. In any case, the species will, according to my view, have to bear the name *Spelerpes maculicaudus*.

"This animal is regarded by those who have observed it in its native haunts to be more aquatic in its habits than is *S.*

longicaudus. (On the contrary, it is perhaps less aquatic than *Spelerpes longicaudus*,—A. W. B.) The ones that I kept for some time in a small aquarium showed a disposition to remain out of the water. They would often climb up on the perpendicular glass wall of the aquarium above the water, and rest there for a long time. If, when thus adhering to the glass, this was turned in a horizontal position, they would continue to stick to the under side of it. I was not successful in my endeavors to get them to eat while in confinement. They appear to endure imprisonment well.

“During the Summer of the present year my son, W. P. Hay, secured two additional specimens of this cave salamander in the region about Bloomington. One of these was taken in May’s Cave, about five miles south of Bloomington and a mile west of Clear Creek Station. It was found sticking to the wall of the cave, about four feet above the water and about one hundred yards from the cave’s mouth. The other was captured in Kern’s Cave, one mile southwest of Bedford, in Lawrence County. This locality is twenty miles south of May’s Cave, and both are about a hundred miles west of Brookville, the original place of the discovery of the species. This shows that the animal is pretty well distributed throughout the southern portion of Indiana, and will probably occur also in the caverns of Kentucky. The specimen taken in Kern’s Cave was also found clinging to the wall above the water, and at a distance of about a quarter of a mile from the entrance. Neither of the specimens made any effort to escape capture. Attention was attracted to both by the gleaming of their eyes in the candle-light.”

GENUS DESMOGNATHUS, BAIRD.

9. *Desmognathus fusca*, Raf. BROWN TRITON. A common species in the more broken parts of Franklin County, about springs and creeks. Doubtless found throughout the White Water Valley. It is also said to be common in Monroe County. The Monroe County form was wrongly identified in a previous paper (Journ. Cin. Soc. Nat. Hist., January, 1887, p. 265). *D. fusca* has also been taken by Prof. W. P. Shannon in Decatur County. The form *D. fusca auriculata* Holb. has been taken near Cincinnati, and is represented in

the Smithsonian Institution by ten specimens (No. 8,819) collected by Mr. J. N. B. Scarborough.

SALIENTIA.—THE TAILLESS BATRACHIANS.

GENUS CHOROPHILUS, BAIRD.

10. *Chorophilus triseriatus*, Wied. STRIPED TREE FROG; TREE FROG; PEEPER. Rather common in Franklin County, where discovered by Mr. Edw. Hughes, March 16, 1889, on which day he took three specimens. They frequent the ditches and sloughs of our uplands, rarely being found in our river valleys.

GENUS HYLA, LAURENTI.

11. *Hyla pickeringii*, Storer. PICKERING'S HYLA; PICKERING'S TREE TOAD. Common in Franklin County. Mr. Hughes found it very numerous on the uplands, where they frequent the ditches, sloughs and roadside ponds. Not so common in the valleys.

12. *Hyla squirella*, Bosc. SQUIRREL TREE TOAD; SQUIRREL HYLA. Two specimens of a peculiar frog from Franklin County, were sent to Prof. Cope for examination in 1887. He wrote upon receiving them that he thought the specimens were this species, but requested the privilege of examining them more carefully at his leisure. After doing so he wrote me, saying: "I have examined the little green frog of the first lot more fully and find it to be *Hyla squirella*, of darker color than usual, and with pale lateral line behind the angle of the mouth absent." One specimen was retained by him and the other returned. In some way my specimen disappeared, and no specimens of this species have since been taken. This is the only locality in the State from which the species has been reported.

REPTILIA—THE REPTILES.

OPHIDIA—THE SERPENTS.

GENUS EUTÆNIA, B. & G.

13. *Eutania sirtalis graminea*, Cope. GRASS SNAKE; GRASS GARTER SNAKE. A new subspecies described by Prof. E. D. Cope, from a specimen in the collection of

Purdue University, No. 295, Richmond, Ind., (Proc. U. S. Nat. Mus., 1888, p. 399). The author says: "This form is a uniform light green above, below yellow, clouded with green. Lips, chin and throat uniform yellow. No stripes or spots on the body, nor markings of any kind on the head. Scales, 19 rows; superior labials, 7; temporals, 1-3, first large; gastrosteges, 150; anal, 1; urosteges, 66 pair, four of the latter undivided; lowest row of scales smooth; length, 495 mm.; tail, 107."

"This form is the extreme in the direction taken by the *E. S. ordinata*, where the bands are entirely wanting, but the quadrate lateral spots remain. In the entire absence of black marks on the labial and abdominal plates, this form differs also from its immediate allies."

14. *Eutania butleri*, Cope. BUTLER'S GARTER SNAKE. A garter snake in the Purdue University collection, No. 264, from Richmond, Ind., was sent to Prof. Cope for examination. He determined it to be a new species, and described it under this name. (Proc. U. S. Nat. Mus., 1888, p. 399-400.) Of it Prof. Cope says: "Scales in nineteen longitudinal rows, the inferior much the widest and keeled. Superior labials, seven. Temporals, 1-1; the second large extending from parietal to labials. Oculars, 1-3. Parietals with the external border abruptly contracted. Gastrosteges, 144; anal, 1; urosteges, 62. Head very little distinct, muzzle conical, a little protuberant; eye not large. Ground color, above olive-brown, which is marked by the usual three longitudinal yellowish bands. The median covers one and two half rows of scales, and the lateral covers the second, third and fourth rows. Both are black bordered on both edges, the border of the latter band interrupted. The segments of the superior border of the lateral band represent the inferior spots of the lateral series; the superior row is wanting from the scales. Gastrosteges and urosteges olive, yellowish in front, dark behind, with a vertical black spot at the anterior border of each end of each of the gastrosteges. Labial scuta without black borders; head olive above without markings, except two small, yellow, black-edged parietal spots in the usual position.

"There is but one specimen of the species (No. 264), which is labelled as coming from Richmond, Ind. It is remarkably distinct from everything which occurs in the United States,

and has only superficial resemblances to the *E. flavilabris*, Cope, of Mexico. Its peculiar characters are the great width of the lateral color band, which covers three rows of scales, one more than in any other species; the black borders of the bands; the absence of well-defined dorsal lateral spots, and the absence of markings on the head and labial scuta. Besides these color marks, the presence of a large second temporal plate extending to the labials is peculiar to this species if found constant; and the narrow conical head is characteristic. In the *E. flavilabris* the general appearance is somewhat similar, but the labial plates are broadly black edged, and the lateral band covers but two rows of scales; there is a large postoral yellow dark-edged crescent, and the second temporal plate is smaller, and does not reach the labials.

"It gives me much pleasure to dedicate this handsome species to Mr. Butler, whose interest and labor in the natural sciences have resulted in many interesting discoveries."

15. *Eutania radix melanotania*, Cope. BLACK-SPOTTED GARTER SNAKE. Two specimens were in the Purdue University collection (Nos. 90 and 312). They were sent to Prof. Cope with the others just mentioned, and were considered to be a new form, and described as this species. (Proc. U. S. Nat. Mus., 1888, pp. 400-401). The following is the description: "Scales in twenty-one longitudinal rows, the inferior largest and keeled. Superior labials, 7 (8); frontal wide, oculars, 1-3. Parietals long, borders regular. Temporals, 1-2, the second above, moderate. Gastrosteges, 153; anal, 1; urosteges, 68. Head distinct; muzzle short, not protuberant. Lateral stripe on third and fourth rows of scales, not black bordered above or below. Dorsal band on one and two half rows of scales nearly completely black bordered. Between these the dorsal ground color is dark olive-brown, but the space is nearly occupied with the two rows of quadrate black spots. Below the lateral stripe two rows of alternating black spots, one on each row of scales, which sometimes coincide, on an olive-brown ground. Gastrosteges with a black longitudinal spot near the end of each, which is frequently confluent with the adjacent ones, from two to five running together to form an interrupted lateral central black stripe. Between these, the gastrosteges black edged, except on the anterior fourth of the length. Length, 285 mm.; tail, 65 mm.

Anterior dorsal region and top of head nearly black; two parietal spots. Labial plates and chin yellow, the former with broad, black posterior edges on the upper lip.

"In this species the scuta present no exceptional features, except that the frontal and prefrontal plates are more than usually wide, as compared with their length. In one specimen there are eight superior labials on one side, but this is probably an abnormality. Its twenty-one rows of scales separate it from the typical *Eutania radix*, the species to which it has closest affinity, to say nothing of various peculiarities of coloration. It is nearest the subspecies *haydeni* of the *E. radix*, but differs from it in the interrupted lateral ventral black band and the black labial borders. It also approximates the *E. flavilabris*, but differs in a way opposite from the *E. butleri*. The dark colors predominate in the present species, and the lateral stripe of the gastrosteges is also peculiar to it. In the *E. flavilabris* there is also a large postoral yellow black-edged crescent, as in *E. marci*, of which no trace appears in *E. r. melanotania*."

GENUS STORERIA, B. & G.

16. *Storeria dekayi* (Holbrook). DEKAY'S SNAKE. VIGO County, (Collection State Normal School, Prof. B. W. Evermann). Somewhat common in Miami County, (J. C. Cunningham). Monroe County, not common, (C. H. Bollman). Two specimens have been taken near Metamora, Franklin County, and these two are the only records from the White Water Valley.

GENUS ELAPS, SCHNEIDER.

17. *Elaps fulvius* (L.). BEAD SNAKE. HARLEQUIN SNAKE. "VIPER." A specimen of this snake, in the collection of Moore's Hill College, Moore's Hill, Ind., was taken in Ripley County (H. F. Bain). An account of this specimen was presented, by Prof. A. J. Bigney, to the Indiana Academy of Science, December 30, 1891. The only other evidence known to me, of the occurrence of this form so far north, is afforded by a specimen in the collection of the Cincinnati Society of Natural History, which was presented by my esteemed friend, the late Dr. John A. Warder. The record shows it to be from

Ohio. Dr. Warder's home was at North Bend, and possibly this specimen came from there.

GENUS SCELOPORUS, WEIGMANN.

18. *Sceloporus undulatus* (Daudin). BROWN SWIFT; COMMON LIZARD; PINE TREE LIZARD; ALLIGATOR LIZARD. Known to our country people by the names, "Fence Lizard," "Brown Lizard" and "Blue-throated Lizard." It appears to be common only in certain localities in the White Water Valley. In suitable localities in Franklin County it is very abundant. It has been taken in Jefferson County, near Madison, by Mr. G. C. Hubbard. Prof. O. P. Jenkins obtained a specimen on the banks of Fourteen Mile Creek, Clarke County, August 20, 1887.

BROOKVILLE, IND., February 9, 1892.

REMARKS CONCERNING THE TEXAS WILD CAT
LATELY PRESENTED TO THE SOCIETY.

BY S. S. SCOVILLE, M. D., LEBANON, O.*

(Read February 2, 1892.)

This cat was about eighteen months old at the time of its accidental death, in September, 1891. It was captured near Red River, in Wilbarger County, Texas, when but three or four weeks old, and presented to my little eleven-year old granddaughter, Bessie Owens, then residing with her parents in the above-named locality. It was fed on cow's milk, and at first would not lap, and had to receive its nourishment from a teaspoon. It was not long, however, until raw flesh became its exclusive diet. It never, up to the time of its death, could be induced to take the smallest particle of cooked meat of any kind. It was exceedingly fond of small birds, especially the English sparrow.

Upon the return of my son-in-law's family to Lebanon, they brought the cat and also a pet prairie wolf with them. These animals were then about four months old. Both were kept tied by means of a leather strap passed around the neck. Confinement was necessary, on account of their ungovernable propensity to nab up chickens. During the cat's life in Texas it was not confined, and was a constant associate of a common house cat, a setter dog and the above-mentioned prairie wolf.

*LEBANON, O., January 25, 1892.

JAS. A. HENSHALL Secretary C. S. N. H.:

Dear Sir—Mr. Raymond Smith informed me that some members of the Society would like to have something from me in relation to the Texas Wild Cat that was presented to the Society's museum through Mr. Dury. This desire, perhaps, arose from the fact that they had heard that the cat had been tamed (?).

I here enclose a short and hastily prepared paper regarding this cat, which, if you think interesting you can read to the Society. And possibly it might be worthy of publication in the JOURNAL. However, I will leave you to make such disposition of the paper as you see proper.

And permit me to say that it will please me very much if you will give the credit of the presentation of this animal to Miss Bessie Owens, instead of myself. It was her cat, and her attachment to it was wonderful.

Yours respectfully,

S. S. SCOVILLE.

Occasionally the wild cat would steal off and prowl around the premises, but would soon return to join its companions. Almost from the time of its capture it became very playful, and was fond of being taken into the lap of some member of the family. Little Bessie was its special favorite, and from her it received the name of Joan, which, in one respect, was quite appropriate, for we know that the Maid of Orleans was an accomplished fighter. Upon its arrival at Lebanon, and up to the time of its death, it manifested this playful disposition. Nothing would please Joan better than to have a romp with children, or some animal that had the courage to approach within playing distance. But few dogs, however, would venture near her, and the domestic cat never. Her long sharp claws often imparted to her playful pranks an unpleasant sensation, and the person who courted lively sport with the cat, would often draw off, wishing that he had gone at it "with gloves." At the approach of night she would often seem lonesome, and was very fond of being brought into the house with the family. This was frequently done, to the great amusement of all present. After a general tear around the room, she would go for the house cat, frightening it nearly out of its wits. And next would be a rough and tumble play with the dog, one of her Texas companions. It was amusing to see how she would manage to spring upon the dog, which was more than twice her weight, and throw him sprawling upon the floor. The dog would often get mad and become furious, while the cat would show no real temper. It could be seen, however, by the little flying tufts of hair that the dog was being severely punished. The fracas would generally end by the dog drawing off for repairs. The cat was always disposed to continue the sport, and it was only by being taken upon the lap of some member of the family that it would quiet down.

Bessie would often carry Joan around in her arms, and occasionally lead her out upon the street, to the great delight—and sometimes fright—of the town children. She had a special fondness for the wolf, but this animal, though quite playful, kept very shy of her catship.

Judging from what I witnessed, respecting the disposition and habits of this particular cat, I am disposed to think that our opinions concerning the wild cat have been, in many re-

spects, quite erroneous. That it can be fairly well tamed, especially when taken young, there can be no question. It has a purr very similar to the domestic cat, but not nearly so loud in proportion to the size of the animal. It never spits and "gets its back up," as does the house cat. Its cry of hunger, of suffering, or for companionship, has no resemblance to the noises made by the last-named animal. Except when mad, it utters but one sound, which is not loud, and resembles somewhat the croak of a small frog. The growl, when mad, or when disturbed while taking its meal, is loud and frightful. It is a real tiger growl, having but little or no resemblance to that of the house cat. This cat, of which I have been speaking, was wakeful, and generally on the move during the day time. It slept, as a rule, during the night. Probably this is not the habit of the wild cat in its wild state.

In sending this animal to Mr. Dury for mounting, I called it the Texas wild cat, simply because it was captured in Texas. As to whether there is a cat entitled to this designation, I do not know. I know comparatively little about the wild cats of America. Many years ago I saw one that was captured in the west part of Marion County, Ohio, that was quite different, in several respects, from the one that has formed the subject of this paper.

NOTE.—This "Wild Cat," *Lynx rufus* (Raf.) is the southern form of the animal. It has been mounted, and is now in the Society's collection.—CHARLES DURY.

ZOOLOGICAL NOTES.

BY CHARLES DURY.

WHAT I FOUND IN THE NEST OF A FIELD MOUSE.

It is well known to entomologists that some very curious and interesting insects live in the nests of mice and other small mammals. December 13, 1891, I went out to hunt nests of "field mice," in hopes of finding a very wonderful little beetle, called *Leptinus testaceus*, said to live in such nests. This species was especial desiderata with me, as I had never succeeded in finding it. I went to an old orchard, and under the first log rolled over I discovered a nest and secured a mouse as she rushed out. She proved to be the "Short-Tailed Meadow Shrew" *Blarina brevicauda* (Say). The nest was made of small bits of leaves of the "Sycamore tree," lined with grass fibers, and situated in a hole or pocket excavated in the ground. I lifted the nest into the sifting net and sifted it over a sheet of white paper, and was overwhelmed at the result. The fine debris was a jumping, crawling mass of insect life, beetles, fleas, ticks and larvæ. I gathered and bottled 107 *Leptinus*, and many ran over the edge of the paper and escaped. There were over a hundred large vicious-looking fleas, most energetic biters (as I discovered from those that secured a lodgment in my clothing). How the mouse could live in such a den is a mystery. The other beetles associated with *Leptinus* were *Staphylinidæ*, or "rove beetles" of species new to me, and so far I have been unable to identify them. *Leptinus* is a small, flat beetle, of a pale testaceous color, one-eighth inch long, without any trace of eyes.

AVONDALE, February 2, 1892.

OCCURRENCE OF THE "PIGEON HAWK," *Falco Columbarius*,
IN CINCINNATI.

A male and female of this hawk were shot on the grounds of the Marine Hospital, Third and Kilgour Streets, December 16, 1891. A "screech owl," *Scops Asio*, was also killed at the

EXPLANATION OF PLATES.

PLATE I.

Fig. 1.—Diagrammatic section of a *Lycoperdon*, showing the cellulose subgleba and the origin and arrangement of the two sets of threads.

Fig. 2.—*Lycoperdon hirtum*, Mart.

Fig. 3.—*Lycoperdon pulcherrimum*, B. & C., with spines enlarged and spores much magnified.

Fig. 4.—*Lycoperdon elegans*, Morg., with spores magnified.

Fig. 5.—*Lycoperdon echinatum*, Pen., with spines enlarged.

Fig. 6.—*Lycoperdon rimulatum*, Peck., with spores.

Fig. 7.—*Lycoperdon glabellum*, Peck.

PLATE II.

Fig. 1.—*Lycoperdon separans*, Peck., with spores.

Fig. 2.—*Lycoperdon pedicellatum*, Peck., with spores.

Fig. 3.—*Lycoperdon eximium*, Morg., with spores.

Fig. 4.—*Lycoperdon Curtisii*, Berk.

Fig. 5.—*Lycoperdon Turneri*, E. & E.

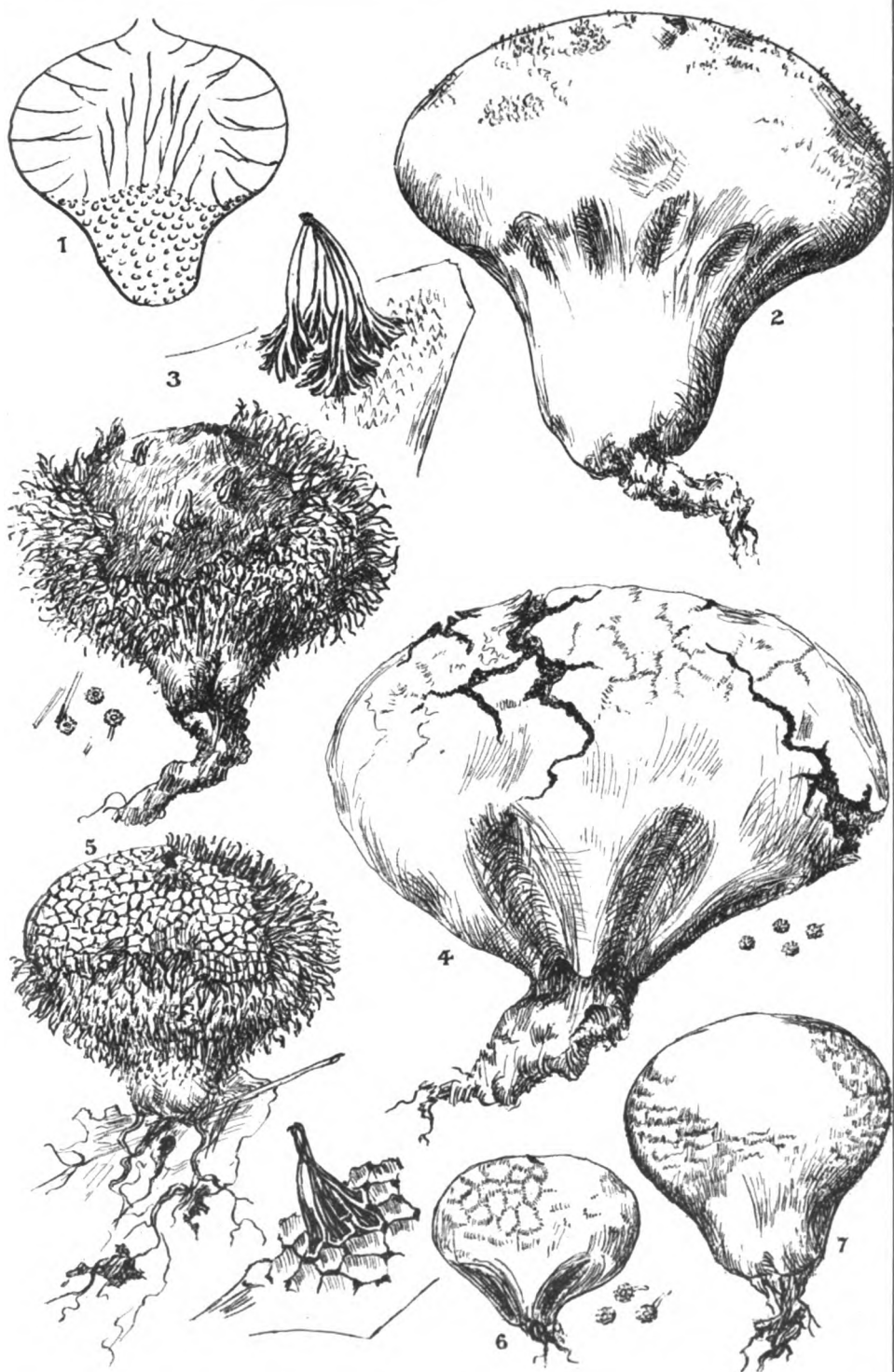
Fig. 6.—*Lycoperdon subincarnatum*, Peck., with spines and pits magnified.

Fig. 7.—*Lycoperdon pusillum*, Batsch.

Fig. 8.—*Lycoperdon acuminatum*, Berk., with spores.

Fig. 9.—*Lycoperdon cepæforme*, Bull.

Fig. 10.—*Lycoperdon coloratum*, Peck.



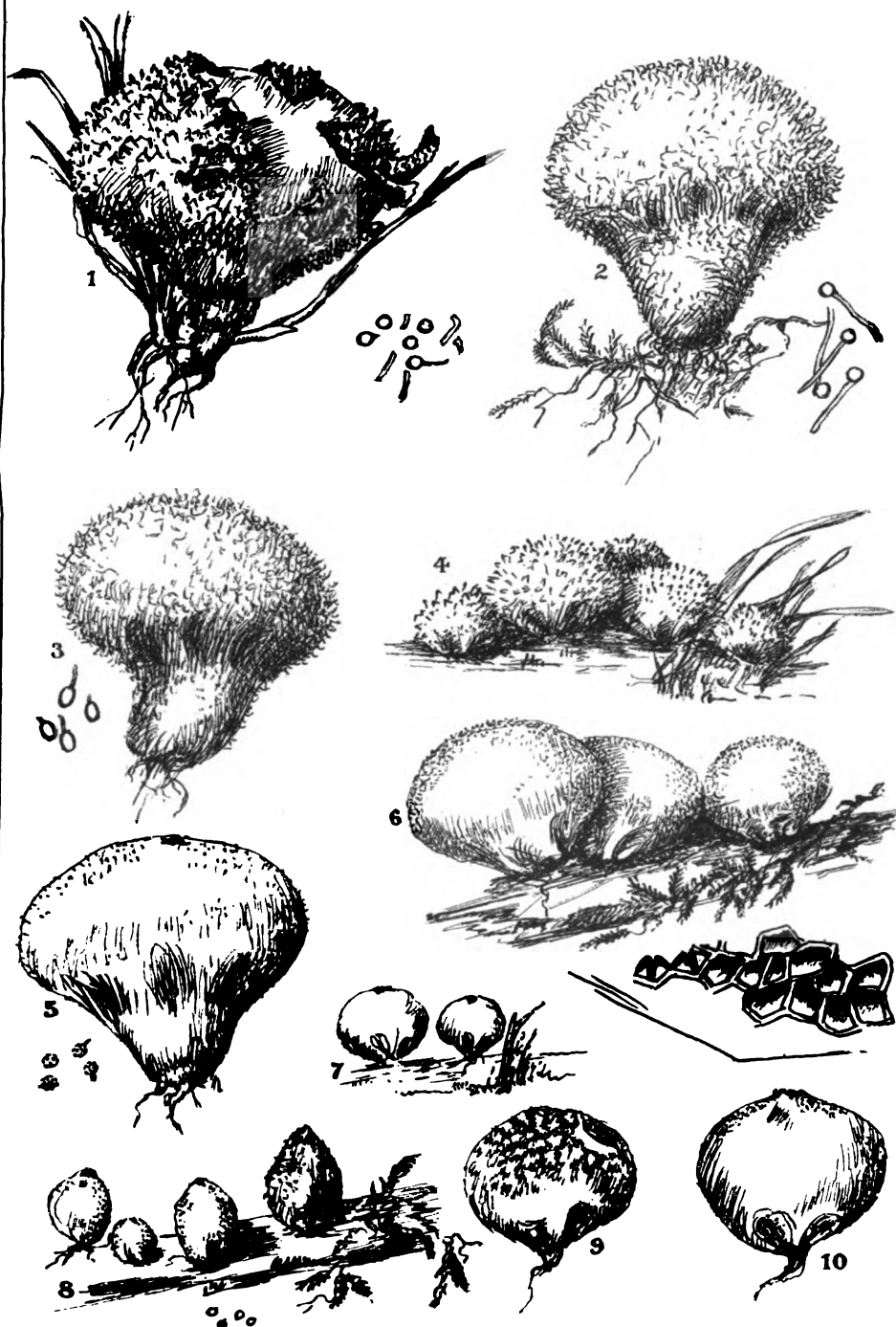




FIG. 1. CREEK AT PT. PLEASANT, O. (MIDDLE SECTION). J. F. J., AUGUST, 1890.





FIG. 3. UPPER PART OF SECTION AT LUDLOW, KY., (No. 4). CIN. GROUP. J. F. J., SEPT., 1890.



EXPLANATION OF PLATE V.

Fig. 1.—*Bovistella Ohiensis*, Ellis & Morgan. A specimen, natural size.

Fig. 2.—Diagrammatic section of *B. Ohiensis*, showing the cellulose and definitely limited subgleba and the free threads of the capillitium.

Fig. 3.—Thread and spores much magnified.

Figs. 4, 5, 6, 7.—*Catastoma circumscissum*, B. & C. Specimens natural size, showing how it grows in the ground, finally breaks away and turns over.

Fig. 8.—Pieces of the threads and the spores much magnified.

Fig. 9.—Diagrammatic section, showing the origin of the threads of the capillitium.

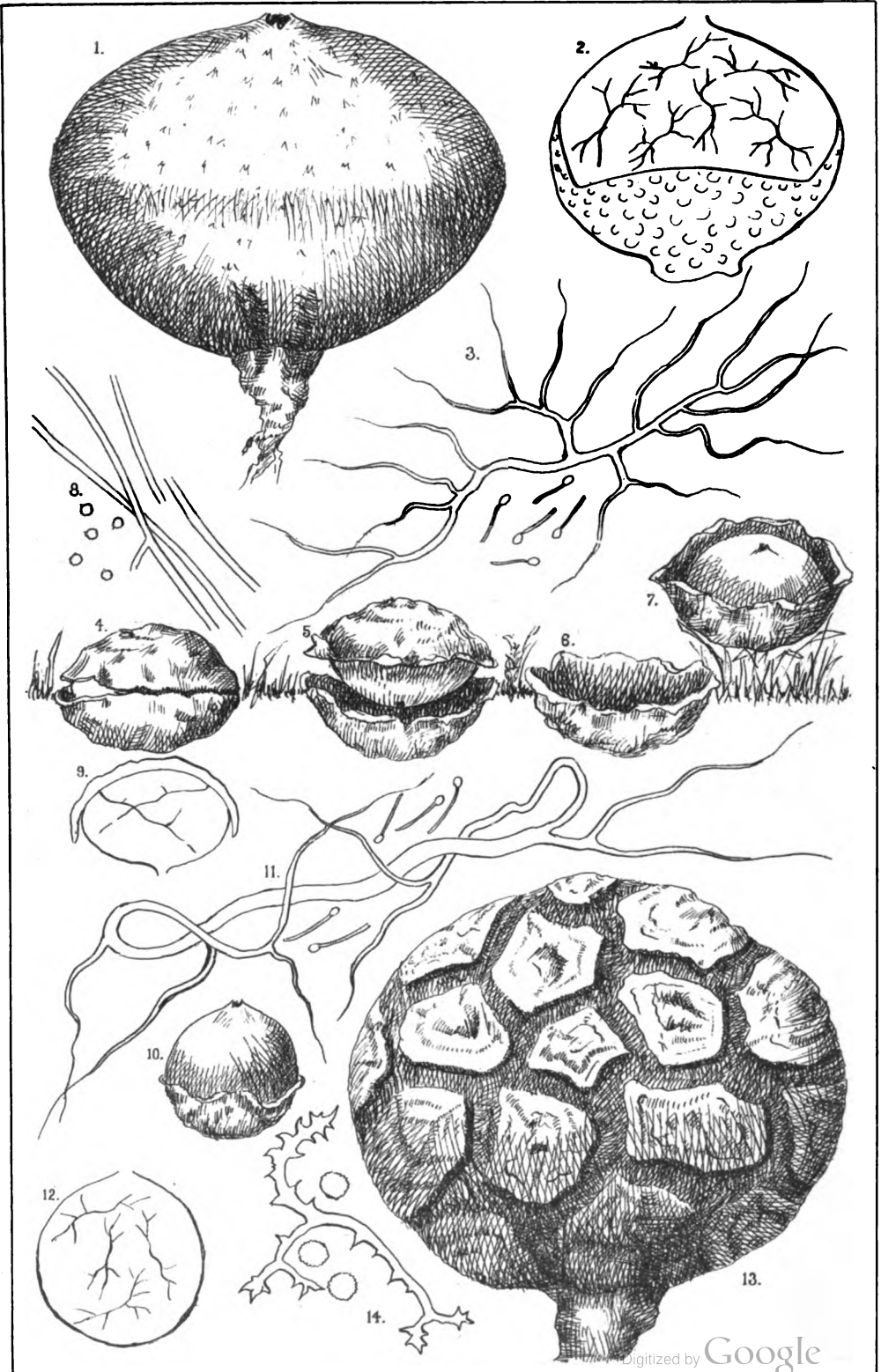
Fig. 10.—*Bovista minor*, Morg. n. sp.

Fig. 11.—Its spores and one thread much magnified.

Fig. 12.—Diagrammatic section of *Bovista*, illustrating the free threads of the capillitium.

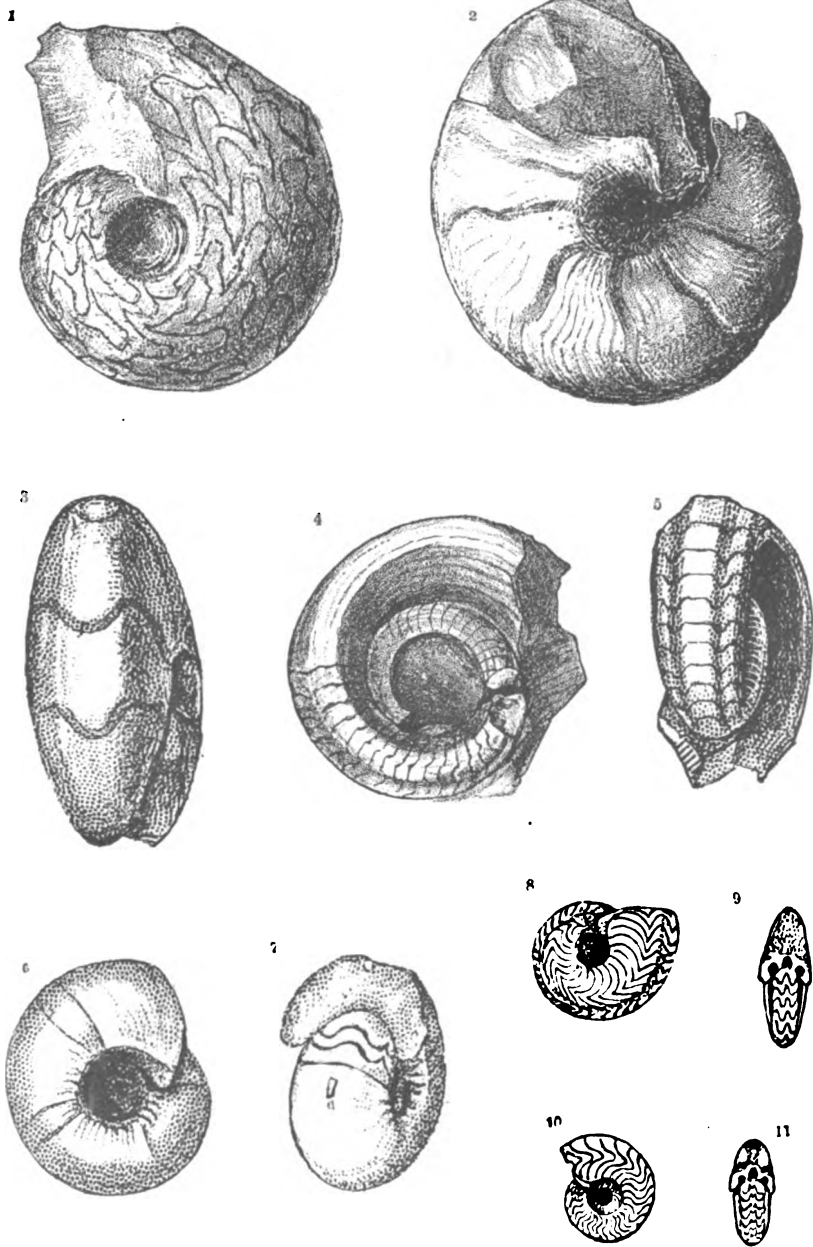
Fig. 13.—*Mycenastrum spinulosum*, Peck.

Fig. 14.—Threads and spores much magnified.



EXPLANATION OF PLATE VI.

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K. H. H. H. H. H.

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